STIC Search Report
EIC 1700

STIC Database Tracking Number: 161804

TO: Raymond Alejandro
Location: Rem 6B59
Art Unit : 1745
August 18, 2005

Case Serial Number: 09/891200

From: Les Henderson
Location: EIC 1700
REM 4B28 / 4A30
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Search Notes

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=> d his ful

     (FILE 'HOME' ENTERED AT 08:26:50 ON 17 AUG 2005)

     FILE 'HCAPLUS' ENTERED AT 08:27:35 ON 17 AUG 2005
                E US20020031695/PN
L1            1 SEA ABB=ON  PLU=ON  US20020031695/PN
                D ALL
                SEL L1 RN

     FILE 'REGISTRY' ENTERED AT 08:31:04 ON 17 AUG 2005
L2           14 SEA ABB=ON  PLU=ON  (12023-04-0/BI OR 12196-72-4/BI OR
                1333-74-0/BI OR 153328-13-3/BI OR 18649-05-3/BI OR
                191980-68-4/BI OR 251566-28-6/BI OR 395656-87-8/BI OR
                395656-88-9/BI OR 67-56-1/BI OR 7440-02-0/BI OR 7440-05-3
                /BI OR 7440-32-6/BI OR 7440-62-2/BI)
                D SCAN
                E 1333-74-0/RN
L3            1 SEA ABB=ON  PLU=ON  1333-74-0/RN
                D SCAN
                E 67-56-1/RN
L4            1 SEA ABB=ON  PLU=ON  67-56-1/RN
                D SCAN
                E 7440-05-3/RN
L5            1 SEA ABB=ON  PLU=ON  7440-05-3/RN
                D SCAN
                E 7440-32-6/RN
L6            1 SEA ABB=ON  PLU=ON  7440-32-6/RN
                D SCAN
                E SILVER/CN
L7            1 SEA ABB=ON  PLU=ON  SILVER/CN
                D RN
                E 7440-22-4/RN
L8            1 SEA ABB=ON  PLU=ON  7440-22-4/RN
                D SCAN
                E COPPER/CN
L9            1 SEA ABB=ON  PLU=ON  COPPER/CN
                D RN
                E 7440-50-8/RN
L*** DEL      1 S 7440-50-8/RN
                D SCAN
                E 7440-62-2/RN
L11           1 SEA ABB=ON  PLU=ON  7440-62-2/RN
                D SCAN
                E LANTHANUM/CN
L12           1 SEA ABB=ON  PLU=ON  LANTHANUM/CN
                D SCAN
                D RN
                E 7439-91-0/RN
L13           1 SEA ABB=ON  PLU=ON  7439-91-0/RN
                D SCAN
                E 7440-02-0/RN
L14           1 SEA ABB=ON  PLU=ON  7440-02-0/RN
                D SCAN
                E IRON/CN
L15           1 SEA ABB=ON  PLU=ON  IRON/CN
                D RN
                E 7439-89-6/RN
L16           1 SEA ABB=ON  PLU=ON  7439-89-6/RN
                D SCAN
                E CHROMIUM/CN
L17           1 SEA ABB=ON  PLU=ON  CHROMIUM/CN
                D RN
                E 7440-47-3/RN
L18           1 SEA ABB=ON  PLU=ON  7440-47-3/RN
                D SCAN
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                D SCAN L2
                E 12023-04-0/RN
L19           1 SEA ABB=ON  PLU=ON  12023-04-0/RN
                D SCAN
                E AGPD/MF
L20           1 SEA ABB=ON  PLU=ON  AGPD/MF
                D SCAN
                D RN
                E 60495-83-2/RN
L21           1 SEA ABB=ON  PLU=ON  60495-83-2/RN
L22         366 SEA ABB=ON  PLU=ON  (AG(L)PD)/ELS(L)2/ELC.SUB
                E CUPD/MF
L23           2 SEA ABB=ON  PLU=ON  CUPD/MF
                D SCAN
                D 1-2 RN
L24           1 SEA ABB=ON  PLU=ON  849794-14-5/RN
                D SCAN
L25           1 SEA ABB=ON  PLU=ON  12381-74-7/RN
                D SCAN
L26         265 SEA ABB=ON  PLU=ON  (CU(L)PD)/ELS(L)2/ELC.SUB
                E LANI5/MF
L27           1 SEA ABB=ON  PLU=ON  LANI5/MF
                D SCAN
                E CRV2/MF
                E CRV/MF
L28           4 SEA ABB=ON  PLU=ON  CRV/MF
                D SCAN
                E CRV2/MF
                E V2CR/MF
L29          28 SEA ABB=ON  PLU=ON  34 CR/MAC AND 66 V/MAC
L30          10 SEA ABB=ON  PLU=ON  L29 AND 2/NC
L31         149 SEA ABB=ON  PLU=ON  (CR(L)V)/ELS(L)2/ELC.SUB
L32         209 SEA ABB=ON  PLU=ON  (NI(L)TI(L)V)/ELS(L)3/ELC.SUB
L33         213 SEA ABB=ON  PLU=ON  (NI(L)V)/ELS(L)2/ELC.SUB
L34         310 SEA ABB=ON  PLU=ON  (TI(L)V)/ELS(L)2/ELC.SUB
L35           6 SEA ABB=ON  PLU=ON  (BA(L)CA(L)H(L)NB(L)O)/ELS(L)5/ELC.SU
                B
                D SCAN
L36           5 SEA ABB=ON  PLU=ON  L35 AND H2O
L37           1 SEA ABB=ON  PLU=ON  L35 NOT L36
                D SCAN
L38          43 SEA ABB=ON  PLU=ON  (BA(L)CA(L)NB(L)O)/ELS(L)4/ELC.SUB
L39          42 SEA ABB=ON  PLU=ON  (CS(L)H(L)S(L)O)/ELS(L)4/ELC.SUB
L40          13 SEA ABB=ON  PLU=ON  L39 AND H2O
L41           3 SEA ABB=ON  PLU=ON  (CS(L)S(L)O)/ELS(L)3/ELC.SUB
                D SCAN
                D SCAN L40
L42           6 SEA ABB=ON  PLU=ON  L39 AND SO4
                D SCAN
                E CS5H3(SO4)4
                E CS5H3(SO4)4/MF
                E CS5H4O16.5S16/MF
                E SNCL2/MF
                E CL2SN/MF
L43          10 SEA ABB=ON  PLU=ON  CL2SN/MF
                D SCAN
L44          91 SEA ABB=ON  PLU=ON  (SN(L)CL(L)H(L)O)/ELS(L)4/ELC.SUB
                E TIN CHLORIDE HYDRATE/CN
L45          38 SEA ABB=ON  PLU=ON  L44 AND H2O
L46          14 SEA ABB=ON  PLU=ON  (AG(L)I(L)W(L)O)/ELS(L)4/ELC.SUB
                E H2KO4P/MF
L47          33 SEA ABB=ON  PLU=ON  H2KO4P/MF
                E TETRAAMMONIUM DIHYDROGEN TRISELENATE/CN
L48          52 SEA ABB=ON  PLU=ON  (N(L)H(L)SE(L)O)/ELS(L)4/ELC.SUB
                E CSDO4S/MF
L49           8 SEA ABB=ON  PLU=ON  (CS(L)D(L)S(L)O)/ELS(L)4/ELC.SUB
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              D SCAN
L50        55 SEA ABB=ON  PLU=ON  (CS(L)H(L)P(L)O)/ELS(L)4/ELC.SUB
L51         2 SEA ABB=ON  PLU=ON  L49 AND SO4
              D SCAN
L52         1 SEA ABB=ON  PLU=ON  L50 AND PO4
              D SCAN
L53        23 SEA ABB=ON  PLU=ON  (SR(L)ZR(L)Y(L)O)/ELS(L)4/ELC.SUB
L54        15 SEA ABB=ON  PLU=ON  (SI(L)N(L)H(L)O(L)P)/ELS(L)5/ELC.SUB

              D SCAN
L55     33454 SEA ABB=ON  PLU=ON  (SI(L)O(L)P)/ELS
L56        60 SEA ABB=ON  PLU=ON  L55 AND AMMONIUM
L57        13 SEA ABB=ON  PLU=ON  L56 AND PHOSPHATE
              D SCAN
L58         5 SEA ABB=ON  PLU=ON  L57 AND (SILICON OR SILICA OR
              SILICATE)
              D SCAN
              E SILICA/CRN
              E SILICA/RN
              E SILICA/CN
L59         1 SEA ABB=ON  PLU=ON  SILICA/CN
              D RN
L60      2201 SEA ABB=ON  PLU=ON  7631-86-9/CRN
              E POLYPHOSPHATE/CN
              E PHOSPHATE/CN
L61         1 SEA ABB=ON  PLU=ON  PHOSPHATE/CN
              D SCAN
              D RN
L62     14061 SEA ABB=ON  PLU=ON  14265-44-2/CRN
              E AMMONIUM/CN
L63         1 SEA ABB=ON  PLU=ON  AMMONIUM/CN
              D SCAN
              D RN
L64      2837 SEA ABB=ON  PLU=ON  14798-03-9/CRN
L65         0 SEA ABB=ON  PLU=ON  L60 AND L62 AND L64
L66         2 SEA ABB=ON  PLU=ON  (LA(L)SR(L)SC(L)O(L)MG)/ELS(L)5/ELC.S
              UB
              D SCAN
L67        64 SEA ABB=ON  PLU=ON  (BA(L)CE(L)ZR(L)O(L)(GD OR ND))/ELS(L
              )5/ELC.SUB
              E ZIRCONIUM PHOSPHATE PYROPHOSPHATE/CN
L68        26 SEA ABB=ON  PLU=ON  (ZR(L)P(L)O)/ELS(L)3/ELC.SUB
L69         1 SEA ABB=ON  PLU=ON  L68 AND PYROPHOSPHATE
              D SCAN
L70         0 SEA ABB=ON  PLU=ON  L68 AND MESOPOROUS
L71         1 SEA ABB=ON  PLU=ON  L68 AND P2O7
              D SCAN
L72         1 SEA ABB=ON  PLU=ON  L69 OR L71

     FILE 'HCAPLUS' ENTERED AT 11:10:18 ON 17 AUG 2005
              E FUEL CELLS/CT
              E E3+ALL
L73     89636 SEA ABB=ON  PLU=ON  FUELCELL? OR FUEL?(2A)CELL? OR FC OR
              SOFC OR DFC OR PEMFC
              E ELECTROLYTE/CT
              E E3+ALL
              E ELECTROLYTES/CT
              E E3+ALL
L74      3685 SEA ABB=ON  PLU=ON  ("FUEL CELL ELECTROLYTES"/CT OR
              "FUEL-CELL ELECTROLYTES"/CT)
L75   3535795 SEA ABB=ON  PLU=ON  ELECTROLYT? OR ELECTRO(A)LYT? OR
              SALT? OR ION? OR CATION? OR ANION? OR COUNTERION? OR
              COUNTER(A)ION?
L76     25758 SEA ABB=ON  PLU=ON  L73(L)L75
L77     25758 SEA ABB=ON  PLU=ON  L74 OR L76
              E SUPPORT/CT
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                E E3+ALL
                E SUPPORTS/CT
                E E3+ALL
L78       10663 SEA ABB=ON  PLU=ON  METAL?(A)SUPPORT?
L79          22 SEA ABB=ON  PLU=ON  (METAL?(A)HYDRID?)(2A)SUPPORT?
L80          28 SEA ABB=ON  PLU=ON  (METAL?(A)HYDRID?)(3A)SUPPORT?
L81           1 SEA ABB=ON  PLU=ON  L80 AND L77
                D SCAN
L82          78 SEA ABB=ON  PLU=ON  L78 AND L77
L83       10591 SEA ABB=ON  PLU=ON  METAL?(A)HYDRID?
L84          91 SEA ABB=ON  PLU=ON  L83 AND L77
L85        7974 SEA ABB=ON  PLU=ON  (ELECTRON# OR HOLE# OR CHARGE#)(2A)IN
                SULAT?
                E PROTON/CT
                E PROTONS/CT
L86       49586 SEA ABB=ON  PLU=ON  (PROTON? OR HYDROGEN? OR H)(A)(CONDUC
                T? OR TRANSFER? OR FLUX?)
L87             QUE ABB=ON  PLU=ON  FILM? OR THINFILM? OR LAYER? OR
                OVERLAY? OR OVERLAID? OR SHEET? OR COAT? OR TOPCOAT? OR
                OVERCOAT? OR SHEATH? OR COVER? OR ENVELOP? OR ENCASE? OR
                ENWRAP? OR OVERSPREAD?
L88           0 SEA ABB=ON  PLU=ON  (L85(3A)L86)(4A)L87
L89           2 SEA ABB=ON  PLU=ON  L85(3A)L86
                D SCAN
L90           1 SEA ABB=ON  PLU=ON  (L85(L)L86)(L)L87
                D SCAN
L91           1 SEA ABB=ON  PLU=ON  L85 AND L86 AND L87
                D SCAN
L92          79 SEA ABB=ON  PLU=ON  (L82 OR L80) AND L77
L93         168 SEA ABB=ON  PLU=ON  L92 OR L84
L94        2735 SEA ABB=ON  PLU=ON  L85(3A)L87
L95         832 SEA ABB=ON  PLU=ON  L86(3A)L87
L96           0 SEA ABB=ON  PLU=ON  L93 AND L94
L97           2 SEA ABB=ON  PLU=ON  L93 AND L95
                D SCAN
L98           0 SEA ABB=ON  PLU=ON  L94 AND L95
                D QUE L75
                D QUE L93
L99          67 SEA ABB=ON  PLU=ON  L93 AND L87
L100        170 SEA ABB=ON  PLU=ON  AREA(2A)SPECIF?(2A)RESISTAN?
L101          0 SEA ABB=ON  PLU=ON  L99 AND L100
L102          0 SEA ABB=ON  PLU=ON  L100 AND L93
L103         40 SEA ABB=ON  PLU=ON  L100 AND L77
                D L103 1-10 KWIC
L104       6827 SEA ABB=ON  PLU=ON  OHM?(A)CM?
L105         43 SEA ABB=ON  PLU=ON  L104 AND L77
L106          0 SEA ABB=ON  PLU=ON  L104 AND L99
L107          0 SEA ABB=ON  PLU=ON  L104 AND L93
L108         83 SEA ABB=ON  PLU=ON  L103 OR L105
L109          0 SEA ABB=ON  PLU=ON  L108 AND L83
L110          0 SEA ABB=ON  PLU=ON  L108 AND L80
                D QUE
L111          0 SEA ABB=ON  PLU=ON  L108 AND L78
L112         16 SEA ABB=ON  PLU=ON  L108 AND SUPPORT?
L113         33 SEA ABB=ON  PLU=ON  L108 AND L87
L114          9 SEA ABB=ON  PLU=ON  L112 AND L87
                D SCAN
L115          0 SEA ABB=ON  PLU=ON  L112 AND (L85 OR L86)
L116          0 SEA ABB=ON  PLU=ON  L113 AND (L85 OR L86)
L117            QUE ABB=ON  PLU=ON  CENTIGRAD? OR CELCIUS? OR DEG?(A)C
L118          1 SEA ABB=ON  PLU=ON  L117 AND L113
                D SCAN
L119          2 SEA ABB=ON  PLU=ON  L117 AND L112
L120          1 SEA ABB=ON  PLU=ON  L117 AND L114
L121          2 SEA ABB=ON  PLU=ON  (L118 OR L119 OR L120)
                D SCAN
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     FILE 'HCAPLUS' ENTERED AT 13:29:41 ON 17 AUG 2005
L122      301584 SEA ABB=ON  PLU=ON  L3
L123       33628 SEA ABB=ON  PLU=ON  L3/P
L124        6045 SEA ABB=ON  PLU=ON  (L122 OR HYDROGEN OR H2 OR H)(L)L77
L125       21754 SEA ABB=ON  PLU=ON  (L122 OR HYDROGEN OR H2 OR H)(L)L73
L126      127675 SEA ABB=ON  PLU=ON  L4
L127      474526 SEA ABB=ON  PLU=ON  L126 OR METHANOL? OR CH3OH OR MEOH
                 OR METHY(A)ALCOHOL?
L128       87588 SEA ABB=ON  PLU=ON  L5
L129      238514 SEA ABB=ON  PLU=ON  L128 OR PALLADIUM? OR PD
L130      155473 SEA ABB=ON  PLU=ON  L6
L131      579372 SEA ABB=ON  PLU=ON  L130 OR TITANIUM OR TI
L132      163618 SEA ABB=ON  PLU=ON  L8
L133         950 SEA ABB=ON  PLU=ON  L129 AND L77
L134         902 SEA ABB=ON  PLU=ON  L131 AND L77
L135        1063 SEA ABB=ON  PLU=ON  (L8 OR SILVER OR AG) AND L77
L136      489861 SEA ABB=ON  PLU=ON  L***

     FILE 'REGISTRY' ENTERED AT 13:57:52 ON 17 AUG 2005
                 E 7740-50-8/RN
                 E 7440-50-8/RN
L137           1 SEA ABB=ON  PLU=ON  7440-50-8/RN
                 D SCAN

     FILE 'HCAPLUS' ENTERED AT 13:58:57 ON 17 AUG 2005
L138        1082 SEA ABB=ON  PLU=ON  (L137 OR COPPER OR CU) AND L77
L139       83983 SEA ABB=ON  PLU=ON  L11
L140        1769 SEA ABB=ON  PLU=ON  (L139 OR VANADIUM OR V) AND L77
L141       46743 SEA ABB=ON  PLU=ON  L13
L142        2410 SEA ABB=ON  PLU=ON  (L141 OR LANTHANUM OR LA) AND L77
L143      312426 SEA ABB=ON  PLU=ON  L14
L144        3793 SEA ABB=ON  PLU=ON  (L143 OR NI OR NICKEL) AND L77
L145        1784 SEA ABB=ON  PLU=ON  (L16 OR IRON OR FE) AND L77
L146      182316 SEA ABB=ON  PLU=ON  L18
L147        1264 SEA ABB=ON  PLU=ON  (L146 OR CHROMIUM OR CR) AND L77
L148        8279 SEA ABB=ON  PLU=ON  (L133 OR L134 OR L135) OR L138 OR
                 L140 OR L142 OR L144 OR L145 OR L147
L149         109 SEA ABB=ON  PLU=ON  L148 AND HYDRID?
L150           6 SEA ABB=ON  PLU=ON  L149 AND SUPPORT?
                 D SCAN
L151        7774 SEA ABB=ON  PLU=ON  (L129 OR L131 OR L139 OR L141 OR
                 L143 OR L146 OR L137 OR L32 OR L6) AND L73
L152       18969 SEA ABB=ON  PLU=ON  (SILVER OR AG OR COPPER OR CU OR
                 VANADIUM OR V OR LANTHANUM OR LA OR NI OR NICKEL OR IRON
                 OR FE OR CHROMIUM OR CR) AND L73
L153       20530 SEA ABB=ON  PLU=ON  L151 OR L152
L154         138 SEA ABB=ON  PLU=ON  L153 AND ((L78 OR L79 OR L80))
L155           0 SEA ABB=ON  PLU=ON  L154 AND L85
L156           7 SEA ABB=ON  PLU=ON  L154 AND L86
L157          50 SEA ABB=ON  PLU=ON  L154 AND L87
L158           5 SEA ABB=ON  PLU=ON  L156 AND L87
L159         301 SEA ABB=ON  PLU=ON  L148 AND (L85 OR L86)
L160           4 SEA ABB=ON  PLU=ON  L148 AND L85
L161         297 SEA ABB=ON  PLU=ON  L148 AND L86
L162           0 SEA ABB=ON  PLU=ON  L148 AND (L85 AND L86)
L163         107 SEA ABB=ON  PLU=ON  L161 AND L87
L164           0 SEA ABB=ON  PLU=ON  L163 AND L100
L165           0 SEA ABB=ON  PLU=ON  L161 AND L100
L166           0 SEA ABB=ON  PLU=ON  L161 AND L104
L167           0 SEA ABB=ON  PLU=ON  L163 AND L104
L168           0 SEA ABB=ON  PLU=ON  L159 AND (L100 OR L104)
L169          49 SEA ABB=ON  PLU=ON  L148 AND (L100 OR L104)
                 D QUE
L170           0 SEA ABB=ON  PLU=ON  L169 AND HYDRID?
L171           0 SEA ABB=ON  PLU=ON  L154 AND (L100 OR L104)
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L172        72 SEA ABB=ON  PLU=ON  L153 AND (L100 OR L104)
               D QUE
               D QUE L151
L173      8232 SEA ABB=ON  PLU=ON  (L129 OR L131 OR L139 OR L141 OR
               L143 OR L146 OR L137 OR L132 OR L6) AND L73
L174     20536 SEA ABB=ON  PLU=ON  L173 OR L152
               D QUE
L175       140 SEA ABB=ON  PLU=ON  L174 AND ((L78 OR L79 OR L80))
L176         7 SEA ABB=ON  PLU=ON  L175 AND (L85 OR L86)
L177        51 SEA ABB=ON  PLU=ON  L175 AND L87
L178        51 SEA ABB=ON  PLU=ON  L177 AND SUPPORT?
L179         0 SEA ABB=ON  PLU=ON  L178 AND (L100 OR L104)
L180         3 SEA ABB=ON  PLU=ON  L178 AND L117
               D SCAN
L181         1 SEA ABB=ON  PLU=ON  L178 AND HYDRID?
               D SCAN
               D KWIC
L182        17 SEA ABB=ON  PLU=ON  L178 AND ALLOY?
L183        34 SEA ABB=ON  PLU=ON  L21
L184       277 SEA ABB=ON  PLU=ON  L183 OR PDAG OR AGPD
L185      3692 SEA ABB=ON  PLU=ON  L22
L186         2 SEA ABB=ON  PLU=ON  L24
               D SCAN
L187        59 SEA ABB=ON  PLU=ON  L25
L188      3841 SEA ABB=ON  PLU=ON  L186 OR L187 OR PDCU OR CUPD OR
               CU(A)PD
L189      6226 SEA ABB=ON  PLU=ON  L184 OR PD(A)AG
               D 1-10 KWIC
L190      1231 SEA ABB=ON  PLU=ON  L26
L191      4463 SEA ABB=ON  PLU=ON  L188 OR L190
L192      1755 SEA ABB=ON  PLU=ON  L27
L193      2529 SEA ABB=ON  PLU=ON  L192 OR LANI5 OR NI5LA
L194       831 SEA ABB=ON  PLU=ON  L19
L195     11602 SEA ABB=ON  PLU=ON  L194 OR TIFE OR FETI OR FE(A)TI
L196         6 SEA ABB=ON  PLU=ON  L28
L197       567 SEA ABB=ON  PLU=ON  L31
L198        15 SEA ABB=ON  PLU=ON  L196 OR CRV2 OR V2CR
               D SCAN
L199       576 SEA ABB=ON  PLU=ON  L197 OR L198
L200       157 SEA ABB=ON  PLU=ON  L32
L201       715 SEA ABB=ON  PLU=ON  L200 OR (V(A)TI)(A)NI OR (V(A)NI)(A)T
               I OR (NI(A)TI)(A)V
L202       779 SEA ABB=ON  PLU=ON  L33
L203      5002 SEA ABB=ON  PLU=ON  V(A)NI
               D 1-10 KWIC
L204      1079 SEA ABB=ON  PLU=ON  L34
L205       290 SEA ABB=ON  PLU=ON  L186 OR L187 OR PDCU OR CUPD
L206     97225 SEA ABB=ON  PLU=ON  L128 OR (L183 OR L184 OR L185 OR
               L186 OR L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE
               OR FETI OR (L196 OR L197 OR L198 OR L199 OR L200) OR
               L202 OR (L204 OR L205)
L207     11082 SEA ABB=ON  PLU=ON  (L183 OR L184 OR L185 OR L186 OR
               L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE OR FETI
               OR (L196 OR L197 OR L198 OR L199 OR L200) OR L202 OR
               (L204 OR L205)
L208       672 SEA ABB=ON  PLU=ON  L206 AND L77
L209        79 SEA ABB=ON  PLU=ON  L207 AND L77
               D QUE L89
L210       208 SEA ABB=ON  PLU=ON  L81 OR L82 OR L84 OR (L112 OR L113
               OR L114) OR L121
L211        43 SEA ABB=ON  PLU=ON  L81 OR L97 OR (L112 OR L113 OR L114)
               OR L121
L212       251 SEA ABB=ON  PLU=ON  L82 OR L84 OR L92 OR L93 OR L99 OR
               L108
L213       251 SEA ABB=ON  PLU=ON  (L210 OR L211 OR L212)
L214        24 SEA ABB=ON  PLU=ON  L213 AND L206
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              D SCAN TI
L215        0 SEA ABB=ON  PLU=ON  L214 AND L1
L216       56 SEA ABB=ON  PLU=ON  L175 AND L213
L217       69 SEA ABB=ON  PLU=ON  L72
L218      181 SEA ABB=ON  PLU=ON  L68
L219      181 SEA ABB=ON  PLU=ON  L217 OR L218
L220    43325 SEA ABB=ON  PLU=ON  PYROPHOSPHAT?
              D 1-10 KWIC
L221   128841 SEA ABB=ON  PLU=ON  CONDUCTOR? OR CONDUCTANT?
L222     2211 SEA ABB=ON  PLU=ON  L73 AND L221
L223    26380 SEA ABB=ON  PLU=ON  L222 OR L77
              D QUE
              D QUE
L224    15515 SEA ABB=ON  PLU=ON  MESOPOR?
L225       85 SEA ABB=ON  PLU=ON  ZIRCONIUM(3A)PHOSPHAT?(3A)PYROPHOSPHA
              T? OR ZR(3A)PO4(3A)P2O7 OR ZR(A)PO4 OR ZR(A)P2O7
L226     4258 SEA ABB=ON  PLU=ON  ZIRCONIUM(A)PHOSPHAT? OR ZIRCONIUM(A)
              PYROPHOSPHAT?
L227       12 SEA ABB=ON  PLU=ON  ZIRCONIUM(2A)PHOSPHAT?(2A)PYROPHOSPHA
              T?
              D SCAN
L228        9 SEA ABB=ON  PLU=ON  ZR(A)P2O7
L229       10 SEA ABB=ON  PLU=ON  ZR(2A)P2O7
L230       19 SEA ABB=ON  PLU=ON  (L227 OR L228)
L231        2 SEA ABB=ON  PLU=ON  L224(2A)L230
L232        2 SEA ABB=ON  PLU=ON  L224(2A)L225
              D SCAN
L233       13 SEA ABB=ON  PLU=ON  L224(2A)L226
              D SCAN
L234       13 SEA ABB=ON  PLU=ON  (L231 OR L232 OR L233)
L235        0 SEA ABB=ON  PLU=ON  L213 AND L234
L236        0 SEA ABB=ON  PLU=ON  L213 AND L234
L237     1204 SEA ABB=ON  PLU=ON  MESO(A)POR?
L238      791 SEA ABB=ON  PLU=ON  MESO(A)(PORE? OR POROUS? OR PORUS?)
              D 1-20 KWIC
L239    16007 SEA ABB=ON  PLU=ON  L224 OR L238
L240     4278 SEA ABB=ON  PLU=ON  L225 OR L226 OR L230
L241       14 SEA ABB=ON  PLU=ON  L240(3A)L239
L242        0 SEA ABB=ON  PLU=ON  L213 AND L241
L243        0 SEA ABB=ON  PLU=ON  L213 AND L239
L244        1 SEA ABB=ON  PLU=ON  L213 AND L240
              D SCAN
L245       89 SEA ABB=ON  PLU=ON  L77 AND L240
L246       46 SEA ABB=ON  PLU=ON  L77 AND L239
              D 1-10 KWIC
              D QUE L241
              D QUE L226
              D QUE L22
              D QUE L225
L247       17 SEA ABB=ON  PLU=ON  ZIRCONIUM(4A)PHOSPHAT?(4A)PYROPHOS?
              D 1-10 KWIC
L248     4990 SEA ABB=ON  PLU=ON  ZIRCONIUM(4A)PHOSPHAT?
              D 1-10 KWIC
L249      206 SEA ABB=ON  PLU=ON  ZIRCONIUM(4A)PYROPHOS?
L250       12 SEA ABB=ON  PLU=ON  ZR(3A)P2O7
L251       13 SEA ABB=ON  PLU=ON  ZR(4A)P2O7
              D 1-13 KWIC
L252       13 SEA ABB=ON  PLU=ON  ZR(5A)P2O7
L253      197 SEA ABB=ON  PLU=ON  ZR(3A)PO4
              D 1-13 KWIC
L254      221 SEA ABB=ON  PLU=ON  ZR(4A)PO4
              D 1-13 KWIC
L255     5189 SEA ABB=ON  PLU=ON  (L247 OR L248 OR L249 OR L250 OR
              L251 OR L252 OR L253 OR L254)
L256     5262 SEA ABB=ON  PLU=ON  L219 OR L255
L257       20 SEA ABB=ON  PLU=ON  L239(4A)L256
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L258          0 SEA ABB=ON  PLU=ON  L257 AND L213
L259         25 SEA ABB=ON  PLU=ON  L239(6A)L256
L260          0 SEA ABB=ON  PLU=ON  L259 AND L213
L261          1 SEA ABB=ON  PLU=ON  L246 AND L256
                D SCAN
L262         89 SEA ABB=ON  PLU=ON  L245 AND L256
L263        153 SEA ABB=ON  PLU=ON  L245 OR L246 OR L257 OR L261 OR L262

                D QUE L245
                D QUE L246
                D QUE L257
                D QUE L261
                D QUE L262
L264        134 SEA ABB=ON  PLU=ON  L246 OR L261 OR L262
                D QUE L246
                D QUE L262
L265          1 SEA ABB=ON  PLU=ON  L246 AND L262
                D SCAN
L266         37 SEA ABB=ON  PLU=ON  L239(L)L256
L267          1 SEA ABB=ON  PLU=ON  L266 AND L73
                D SCAN
L268          3 SEA ABB=ON  PLU=ON  L35
                D SCAN
L269         83 SEA ABB=ON  PLU=ON  L38
L270         84 SEA ABB=ON  PLU=ON  L268 OR L269
L271          0 SEA ABB=ON  PLU=ON  L270 AND L213
L272         16 SEA ABB=ON  PLU=ON  L270 AND L77
L273         20 SEA ABB=ON  PLU=ON  L270 AND L73
L274         20 SEA ABB=ON  PLU=ON  L272 OR L273
                D SCAN TI
L275       1398 SEA ABB=ON  PLU=ON  L39
L276         38 SEA ABB=ON  PLU=ON  L40
L277          4 SEA ABB=ON  PLU=ON  L41
L278       1099 SEA ABB=ON  PLU=ON  L42
                D SCAN L277
L279       1400 SEA ABB=ON  PLU=ON  (L275 OR L276 OR L277 OR L278)
L280          0 SEA ABB=ON  PLU=ON  L213 AND L279
L281         23 SEA ABB=ON  PLU=ON  L279 AND L77
L282          8 SEA ABB=ON  PLU=ON  L279 AND L222
L283         23 SEA ABB=ON  PLU=ON  L279 AND L223
L284         23 SEA ABB=ON  PLU=ON  (L281 OR L282 OR L283)
L285         23 SEA ABB=ON  PLU=ON  L279 AND L73
L286         23 SEA ABB=ON  PLU=ON  L284 OR L285
L287       8574 SEA ABB=ON  PLU=ON  L43
L288        736 SEA ABB=ON  PLU=ON  L44
L289        642 SEA ABB=ON  PLU=ON  L45
                D QUE L287
L290         18 SEA ABB=ON  PLU=ON  ((L287 OR L288 OR L289)) AND L223
L291         44 SEA ABB=ON  PLU=ON  ((L287 OR L288 OR L289)) AND L73
L292        173 SEA ABB=ON  PLU=ON  L46
L293          1 SEA ABB=ON  PLU=ON  L292 AND L223
L294          1 SEA ABB=ON  PLU=ON  L292 AND L73
L295          4 SEA ABB=ON  PLU=ON  SILVER(3A)IODIDE(3A)TETRATUNGSTATE
L296          0 SEA ABB=ON  PLU=ON  L295 AND L223
                D 295 1-4 KWIC
                D 295 1-4 KWIC
                D L295 1-4 KWIC
L297         26 SEA ABB=ON  PLU=ON  L47
L298      19485 SEA ABB=ON  PLU=ON  L297 OR KH2PO4
                D 1-10 KWIC
L299         13 SEA ABB=ON  PLU=ON  L298 AND L223
L300         16 SEA ABB=ON  PLU=ON  L298 AND L73
L301        421 SEA ABB=ON  PLU=ON  L48
L302          2 SEA ABB=ON  PLU=ON  L301 AND L223
L303          3 SEA ABB=ON  PLU=ON  L301 AND L73
L304         57 SEA ABB=ON  PLU=ON  L49
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L305          3 SEA ABB=ON  PLU=ON  L51
L306          1 SEA ABB=ON  PLU=ON  (L304 OR L305) AND L223
L307          1 SEA ABB=ON  PLU=ON  (L304 OR L305) AND L73
L308         46 SEA ABB=ON  PLU=ON  CSDSO4
L309          0 SEA ABB=ON  PLU=ON  L308 AND L223
L310          0 SEA ABB=ON  PLU=ON  L308 AND L73
L311        547 SEA ABB=ON  PLU=ON  L50
L312          5 SEA ABB=ON  PLU=ON  L52
L313        574 SEA ABB=ON  PLU=ON  L311 OR L312 OR CSH2PO4
L314         10 SEA ABB=ON  PLU=ON  L313 AND L223
L315         10 SEA ABB=ON  PLU=ON  L313 AND L73
L316         67 SEA ABB=ON  PLU=ON  L53
L317          8 SEA ABB=ON  PLU=ON  L316 AND L223
L318          8 SEA ABB=ON  PLU=ON  L316 AND L73
L319          9 SEA ABB=ON  PLU=ON  L58
L320          9 SEA ABB=ON  PLU=ON  SILICA(3A)POLYPHOS?(3A)AMMONIUM
L321          1 SEA ABB=ON  PLU=ON  L320 AND L223
L322          1 SEA ABB=ON  PLU=ON  L320 AND L73
L323         82 SEA ABB=ON  PLU=ON  SILICA(3A)?PHOSPHAT?(3A)AMMONIUM
L324          1 SEA ABB=ON  PLU=ON  L58 AND L223
L325          1 SEA ABB=ON  PLU=ON  L58 AND L73
L326          1 SEA ABB=ON  PLU=ON  L323 AND L223
L327          1 SEA ABB=ON  PLU=ON  L323 AND L73
L328          5 SEA ABB=ON  PLU=ON  L66
L329          1 SEA ABB=ON  PLU=ON  L328 AND L73
L330         16 SEA ABB=ON  PLU=ON  L67
L331         11 SEA ABB=ON  PLU=ON  L330 AND L73
L332         11 SEA ABB=ON  PLU=ON  L330 AND L223
L333       1343 SEA ABB=ON  PLU=ON  L223 AND (MU?(W)M OR MICRON? OR
                MICROMETER? OR MICROMETR? OR MICRO(A)(METER? OR METR?))
L334       1343 SEA ABB=ON  PLU=ON  L333 AND L223
L335         17 SEA ABB=ON  PLU=ON  L333 AND L213
L336       7092 SEA ABB=ON  PLU=ON  L223 AND (FACE? OR SIDE? OR SURFACE?)

L337        441 SEA ABB=ON  PLU=ON  L336 AND L86
L338          2 SEA ABB=ON  PLU=ON  L337 AND GAP
                D SCAN
L339        107 SEA ABB=ON  PLU=ON  L337 AND TEMP?
L340         15 SEA ABB=ON  PLU=ON  L339 AND SUPPORT?
L341          0 SEA ABB=ON  PLU=ON  L337 AND L85
L342          7 SEA ABB=ON  PLU=ON  L336 AND L85
L343         22 SEA ABB=ON  PLU=ON  L340 OR L342
L344          6 SEA ABB=ON  PLU=ON  L343 AND (METAL? OR HYDRID?)
                D SCAN
L345        157 SEA ABB=ON  PLU=ON  L223 AND GAP
L346         30 SEA ABB=ON  PLU=ON  L345 AND TEMP?
L347         69 SEA ABB=ON  PLU=ON  L335 OR L338 OR L340 OR (L342 OR
                L343 OR L344) OR L346
L348         55 SEA ABB=ON  PLU=ON  L347 AND TEMP?
L349        126 SEA ABB=ON  PLU=ON  L223 AND (PERCENT? OR PCT? OR
                PER(A)CENT?)
L350         26 SEA ABB=ON  PLU=ON  L349 AND (WEIGHT? OR WT?)
L351          4 SEA ABB=ON  PLU=ON  L348 AND (WEIGHT? OR WT?)
L352         51 SEA ABB=ON  PLU=ON  L150 OR L158 OR (L180 OR L181 OR
                L182) OR L214 OR L244 OR L265 OR L267
L353         20 SEA ABB=ON  PLU=ON  (L272 OR L273 OR L274)
L354         58 SEA ABB=ON  PLU=ON  L286 OR L290 OR L293 OR L294 OR L299
                OR L300 OR L302 OR L303 OR L306
L355         30 SEA ABB=ON  PLU=ON  L307 OR L314 OR L317 OR L321 OR L324
                OR L326 OR L329 OR L332
L356         30 SEA ABB=ON  PLU=ON  L350 OR L351
L357        182 SEA ABB=ON  PLU=ON  (L352 OR L353 OR L354 OR L355 OR
                L356)
L358        241 SEA ABB=ON  PLU=ON  L357 OR L347
L359        230 SEA ABB=ON  PLU=ON  L358 AND L223
                D QUE
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L360         76 SEA ABB=ON  PLU=ON  L359 AND SUPPORT?
L361        197 SEA ABB=ON  PLU=ON  L359 AND (METAL? OR HYDRID? OR L85
                OR L86 OR L100 OR L104 OR FACE? OR SIDE? OR SURFACE? OR
                TEMP?)
L362         73 SEA ABB=ON  PLU=ON  L361 AND SUPPORT?
L363        101 SEA ABB=ON  PLU=ON  L148 AND L361
L364         13 SEA ABB=ON  PLU=ON  L361 AND L149
L365         80 SEA ABB=ON  PLU=ON  L362 OR L364
                D QUE L175
L366         30 SEA ABB=ON  PLU=ON  L361 AND L175
L367         80 SEA ABB=ON  PLU=ON  L365 OR L366
                D QUE L206
L368         35 SEA ABB=ON  PLU=ON  L361 AND L208
L369         89 SEA ABB=ON  PLU=ON  L367 OR L368
L370         56 SEA ABB=ON  PLU=ON  L361 AND L213
L371         96 SEA ABB=ON  PLU=ON  L369 OR L370
L372          3 SEA ABB=ON  PLU=ON  L361 AND L245
L373         98 SEA ABB=ON  PLU=ON  L371 OR L372
                D QUE L263
                D QUE L264
L374          6 SEA ABB=ON  PLU=ON  L361 AND L264
L375         99 SEA ABB=ON  PLU=ON  L373 OR L374
L376         10 SEA ABB=ON  PLU=ON  L361 AND L314
L377        105 SEA ABB=ON  PLU=ON  L375 OR L376
L378         16 SEA ABB=ON  PLU=ON  L361 AND (L317 OR L321 OR L324 OR
                L326 OR L329 OR L331)
L379        116 SEA ABB=ON  PLU=ON  L377 OR L378

=> => d l379 1-116 cbib abs hitstr hitind
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L379 ANSWER 1 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:741752 Development of Nafion-/SiO2/phosphotunstic acid nanocomposite membranes for high **temperature** proton exchange membrane fuel cells. Liu, Yuxiu; Kunz, H. Russell; Fenton, James M.; Zhu, Lei (Polymer Program, Institute of Materials Science and Department of Chemical Engineering, University of Connecticut, Storrs, CT, 06269, USA). Abstracts of Papers, 230th ACS National Meeting, Washington, DC, United States, Aug. 28-Sept. 1, 2005, PMSE-414. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69HFCL.

AB Research has been conducted to improve the conductivity of Nafion--based nanocomposite membranes for proton exchange membrane (PEM) **fuel cells** at high **temperature** and low relative humidity. 3-Aminopropyl triethoxysilane (APTES) modified **mesoporous** silica (SBA-15) was used to immobilize phosphotungstic acid (PTA) through **ionic** complexation processes. These composites were denoted as SAP. Thermogravimetric anal. (TGA) was used to determine the APTES functionalization ratio and PTA immobilization **percentage.** TGA results indicated that PTA was successfully immobilized, and the highest loading on porous silica was ca. 67 **weight%**. Nafion- membranes with different SAP contents (denoted as NSAP) were cast from 5 **weight%** ethanol solution at 70 °C. Small-angle X-ray scattering results on the SAP composites revealed hexagonal cylinder morphol., which was further confirmed by transmission electron microscopy. DC conductivity measurements at various **temps.** and relative humidities showed slightly higher conductivity for the NSAP membranes than the recast Nafion- membrane.

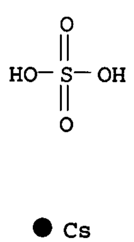
L379 ANSWER 2 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:638259 Polymer nanocomposite membranes, their manufacture, and their use for membrane-electrode assemblies and polymer **electrolyte fuel cells.** Lee, Hee-Wu; Song, Ming-Gyu; Kim, Young-Taek; Park, Seung-Bae; Park, Jin-Ki (Hyundai Motor Corp., S. Korea; Kia Motors Corp.). Jpn. Kokai Tokkyo Koho JP 2005197209 A2 20050721, 16 pp. (Japanese). CODEN:

JKXXAF. APPLICATION: JP 2004-258793 20040906. PRIORITY: KR 2003-100130 20031230.

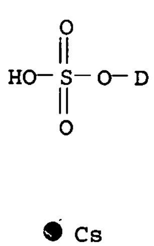
AB The polymer nanocomposite membranes comprise 30-95 **weight%** matrixes comprising **ion**-exchange resins having **cation**-exchange groups in **side** chains and 5-70 **weight%** finely and uniformly dispersed powders of solid **H+ conductors.** The polymer nanocomposite membranes are manufactured by (a) dissolving **ion**-exchange resins having **cation**-exchange groups in **side** chains into organic solvents to produce **ion**-exchange resin solns. (concentration 0.5-30 **weight%**), (b) mixing the solns. with porogens under high-frequency ultrasonic waves and forming polymer membranes, (c) extracting the porogens from the polymer membranes to form nanopores, and (d) filling the nanopores with solid **H+ conductors** so that 5-70 **weight%** of the solid **H+ conductors** are dispersed in 30-95 **wt .%** of the **ion**-exchange resins. The nanocomposite membranes have high elec. conductivity at high **temperature**, good mech. properties, dimensional stability, and high fuel-separation performance are useful for membrane-electrode assemblies for polymer **electrolyte fuel cells.**

IT **7789-16-4**, Cesium hydrogen sulfate **93487-19-5**, Cesium deuterium sulfate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



RN 93487-19-5 HCAPLUS
CN Sulfuric acid-d, monocesium salt (9CI) (CA INDEX NAME)



IC ICM H01M008-02
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST **cation** exchanger **proton conductor** nanocomposite membrane; polymer **electrolyte fuel**

cell nanocomposite membrane
IT Polyimides
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(coating on nanocomposite membrane; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Glycols
RL: NUU (Other use, unclassified); USES (Uses)
(ethers, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Polyoxyalkylenes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Ethers
RL: NUU (Other use, unclassified); USES (Uses)
(glycol, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT **Cation** exchangers
Fuel cell electrolytes
Ionic conductors
Membranes, nonbiological
Nanocomposites
Porogens
(manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Fluoropolymers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Solvents
(organic; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT **Fuel cells**
(polymer **electrolyte**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT Fluoropolymers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
IT **Ionomers**

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT Polyesters
RL: NUU (Other use, unclassified); USES (Uses)
(porogen; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT Clays
Mica-group minerals
Zeolites (synthetic)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**support** for **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT Phosphosilicate glasses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(zirconium phosphosilicate, **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 9002-86-2, Poly(vinyl chloride) 24937-79-9, Poly(vinylidene fluoride) 24981-14-4, Poly(vinyl fluoride)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(coating on nanocomposite membrane; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 7631-86-9, Silica
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(glass component, **support** for **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 1314-23-4, Zirconia 1314-56-3, Phosphorus pentoxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(glass component; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
RL: NUU (Other use, unclassified); USES (Uses)
(porogen, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 84-74-2, Dibutyl phthalate 103-23-1, Dioctyl adipate 117-81-7, Dioctyl phthalate 1330-78-5, Tritolyl phosphate 9003-53-6,

Polystyrene 19295-81-9, Heptyl nonyl phthalate 24980-41-4,
Polycaprolactone 25248-42-4, Polycaprolactone 27554-26-3
RL: NUU (Other use, unclassified); USES (Uses)
(porogen; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 13772-29-7P
RL: DEV (Device component use); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PYP (Physical process); PREP (Preparation); PROC (Process); USES (Uses)
(**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 1314-60-9, Antimony pentoxide **7789-16-4**, Cesium hydrogen sulfate 12209-84-6, Antimony nitrate oxide (Sb4(NO3)2O5) 18282-10-5, Tin dioxide **93487-19-5**, Cesium deuterium sulfate 107069-88-5, Antimony hydroxide oxide phosphate (Sb3(OH)3O3(PO4)2) 107250-82-8, hydrogen titanium oxide (H2Ti4O9) 142487-25-0 165901-90-6 210536-75-7 307943-55-1, Uranium arsenate oxide (U(HAsO4)O2) 307943-57-3, Uranium oxide phosphate (UO2(HPO4)) 860020-46-8 860020-47-9 860020-48-0
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 60-29-7, Diethyl ether 64-17-5, Ethanol 67-56-1, Methanol 67-63-0, 2-Propanol 67-64-1, Acetone 67-68-5, Dimethyl sulfoxide 68-12-2, Dimethylformamide 78-59-1, Isophorone 78-93-3, Methyl ethyl ketone 96-48-0, Butyrolactone 108-10-1, Methyl isobutyl ketone 108-83-8, Diisobutyl ketone 108-94-1, Cyclohexanone 109-99-9, Tetrahydrofuran 112-15-2, Carbitol acetate 115-10-6, Dimethyl ether 123-42-2, Diacetone alcohol 123-86-4, N-Butyl acetate 127-19-5, Dimethylacetamide 141-97-9, Ethyl acetoacetate 512-56-1, Trimethyl phosphate 632-22-4, Tetramethylurea 872-50-4, N-Methyl-2-pyrrolidone
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

IT 1344-28-1, Alumina
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**support** for **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)

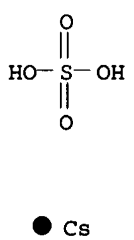
L379 ANSWER 3 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:591653 Document No. 143:81245 Method for manufacture of **proton-conductive** solid **electrolyte** films for **fuel cells** showing high operating **temperature.** Otomo, Junichiro; Takahashi, Hiroshi; Ogura, Masaru; Wang, Ju-Jiang; Kobayashi, Takeshi; Waki, Keiko; Nagamoto, Hidetoshi (Tokyo University, Japan). Jpn. Kokai Tokkyo Koho JP 2005183121 A2 20050707, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-420994 20031218.

AB The method includes preparing silica thin films having open nanopores on main **surfaces**, preparing aqueous solns. or melts containing CsHSO4 (I) and/or **CsH2PO4** (II), and impregnating the nanopores

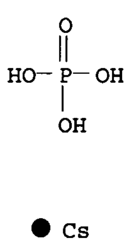
with the solns. or melts to form solid **electrolyte** films comprising I and/or II. **Fuel cells** using the solid **electrolyte** films show operating **temperature** ≥150°.

IT **7789-16-4**, Cesium hydrogen sulfate **18649-05-3**, Cesium dihydrogen phosphate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**electrolytes**; manufacture of **proton-conductive** solid **electrolyte** films for **fuel cells** showing high operating **temp**.)

RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



IC ICM H01B013-00
ICS H01B001-06; H01M008-02; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST cesium hydrogen sulfate nanoporous silica solid **electrolyte** film; nanoporous silica film solid **electrolyte** cesium dihydrogen phosphate; **fuel cell** solid **electrolyte proton conductor**
IT **Fuel cell electrolytes**
Solid **electrolytes**
(manufacture of **proton-conductive** solid **electrolyte** films for **fuel cells** showing high operating **temperature**)
IT **Ionic conductors**
(**protonic**; manufacture of **proton-conductive** solid **electrolyte** films for **fuel cells** showing high operating **temp**.)
IT **Fuel cells**
(solid **electrolyte**; manufacture of **proton-conductive** solid **electrolyte** films for **fuel cells** showing high operating **temp**.)

IT 7789-16-4, Cesium hydrogen sulfate 18649-05-3,
Cesium dihydrogen phosphate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(electrolytes; manufacture of proton-conductive solid electrolyte films for fuel cells showing high operating temp.)

IT 7631-86-9, Silica, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(nanoporous film supports; manufacture of proton-conductive solid electrolyte films for fuel cells showing high operating temp.)

L379 ANSWER 4 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:552858 Effect of water vapor on **proton conduction** of cesium dihydrogen phosphateand application to intermediate **temperature** fuel cells. Otomo, Junichiro; Tamaki, Takanori; Nishida, Satoru; Wang, Shuqiang; Ogura, Masaru; Kobayashi, Takeshi; Wen, Ching-ju; Nagamoto, Hidetoshi; Takahashi, Hiroshi (Department of Environmental Chemical Engineering, Faculty of Engineering, Kogakuin University, Hachioji-city, Tokyo, 192-0015, Japan). Journal of Applied Electrochemistry, 35(9), 865-870 (English) 2005. CODEN: JAELBJ. ISSN: 0021-891X. Publisher: Springer.

AB The **proton conduction** and superionic phase transition of cesium dihydrogen phosphate, **CsH2PO4** (CDP), were investigated under various humid conditions to evaluate the applicability of a **CsH2PO4** solid **electrolyte** to an intermediate **temperature fuel cell** operating between 230 °C and 300 °C. The phase stability, superionic phase transition, and reversibility of dehydration of **CsH2PO4** were evaluated under different ambient water vapor concns., from 0 to 90 mol%, through the measurements of conductivity The dependence of conductivity on the water vapor concentration and the demonstrated reversibility of dehydration clearly showed the range in which **CsH2PO4** is applicable to the intermediate **temperature fuel cell.** Addnl., we evaluated the protonic transport number of **CsH2PO4**, which was almost unity, and demonstrated **fuel cell** operation at 250 °C using a single cell fabricated with the **CsH2PO4 electrolyte.**

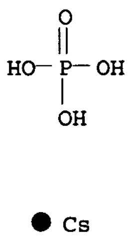
CC 72 (Electrochemistry)

L379 ANSWER 5 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:452567 Document No. 143:46007 An intermediate **temperature proton-conducting** electrolyte based on a **CsH2PO4**/SiP2O7 composite. Matsui, Toshiaki; Kukino, Tomokazu; Kikuchi, Ryuji; Eguchi, Koichi (Department of Energy and Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto University, Kyoto, 615-8510, Japan). Electrochemical and Solid-State Letters, 8(5), A256-A258 (English) 2005. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB A p-conducting electrolyte based on a **CsH2PO4**/SiP2O7 composite was synthesized and its electrochem. properties were studied at 110-287°. Addition of SiP2O7 as **supporting** matrix brought about a structural change of the conducting phase, **CsH2PO4**, into CsH5(PO4)2. The resultant composite electrolyte showed high thermal stability and conductivity under 30% H2O/Ar atmospheric The maximum conductivity was 44 mS/cm at 266° and the **temperature** dependence of the conductivity did not have the conductivity irregularities of the **CsH2PO4**-based composite.

IT **18649-05-3P**, Cesium phosphate (**CsH2PO4**)
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or

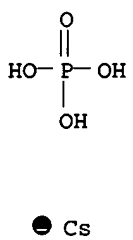
engineered material use); PREP (Preparation); USES (Uses)
(composite with silicon pyrophosphate; **CsH2PO4**/SiP2O7 composite **proton-conducting electrolyte** for intermediate **temperature fuel cells**)
RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST cesium phosphate silicon pyrophosphate composite **electrolyte fuel cell**
IT **Fuel cell electrolytes**
(**CsH2PO4**/SiP2O7 composite **proton-conducting electrolyte** for intermediate **temperature fuel cells**)
IT **Ionic conductors**
(**protonic**; **CsH2PO4**/SiP2O7 composite **proton-conducting electrolyte** for intermediate **temperature fuel cells**)
IT 13827-38-8P, Silicon pyrophosphate (SiP2O7)
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(composite with cesium phosphate; **CsH2PO4**/SiP2O7 composite **proton-conducting electrolyte** for intermediate **temperature fuel cells**)
IT **18649-05-3P**, Cesium phosphate (**CsH2PO4**)
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(composite with silicon pyrophosphate; **CsH2PO4**/SiP2O7 composite **proton-conducting electrolyte** for intermediate **temperature fuel cells**)

L379 ANSWER 6 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:452563 Document No. 143:46005 Thin-membrane solid-acid fuel cell. Uda, Tetsuya; Haile, Sossina M. (Department of Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Electrochemical and Solid-State Letters, 8(5), A245-A246 (English) 2005. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.
AB Solid-acid **fuel cells** (SAFCs) use an anhydrous, non-polymeric p conducting **electrolyte** and operate at slightly elevated **temps.** By **supporting** thin **CsH2PO4 electrolyte** membranes (25-36 μm), on porous stainless steel gas-diffusion electrodes, SAFCs with peak power densities ≤415 mW/cm2 were obtained. Cells were operated at .apprx.240° with humidified H2 supplied to the anode and humidified O2 supplied to the cathode. Despite the thinness of the membranes, the open-circuit voltages were high, 0.91-1.01 V. SAFCs are competitive energy conversion devices.
IT **18649-05-3**, Cesium phosphate (**CsH2PO4**)
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; in thin membrane solid-acid **fuel**

cells)
RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); USES (Uses)
(electrode **support**; in thin membrane solid-acid fuel cells)
IT **18649-05-3**, Cesium phosphate (**CsH2PO4**)
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; in thin membrane solid-acid **fuel cells**)

L379 ANSWER 7 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:315268 Document No. 142:466376 CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells.** Yoshida, Kotaro; Ishida, Masayoshi; Okada, Tatsuhiro (Graduate School of Systems and Information Engineering, University of Tsukuba, Tennoudai 1-1-1, Tsukuba, 305-8573, Japan). Electrochemistry (Tokyo, Japan), 73(4), 298-300 (Japanese) 2005. CODEN: EECTFA. ISSN: 1344-3542. Publisher: Electrochemical Society of Japan.
AB Fluorination is known to prohibit CO adsorption at **LaNi5** group **metal hydride.** This characteristic was applied to fabricate a CO tolerant fluorinated Pt black catalyst by exposing it in diluted F2 gas. To test the CO tolerance, H2 oxidation current in H2 gas with fixed amount of CO was measured by using a half cell simulating the anode of a polymer **electrolyte fuel cell.** The results show that fluorinated Pt black, especially those treated in low F2 concentration (1%), improved CO tolerance. On the other hand, treating in high F2 concentration (10%) decreased the active **surface** area of Pt catalyst for H2 oxidation These electrochem. characteristics together with the results in XPS spectra indicated that chemisorption of F, not the formation of Pt fluoride, improved the CO.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT **Fuel cell** anodes
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)
IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)
IT 7782-41-4, Fluorine, uses
RL: MOA (Modifier or additive use); USES (Uses)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)
IT 630-08-0, Carbon monoxide, miscellaneous
RL: MSC (Miscellaneous)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)

L379 ANSWER 8 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:190841 Ba3-xKxHx(PO4)2:synthesis and properties of a new class of solid state **proton conductors.** Chisholm, Calum R. I.; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Abstracts of Papers, 229th ACS National Meeting, San Diego, CA, United States, March 13-17, 2005, INOR-451. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69GQMP.

AB Compds. with the general formula M+13H(XO4),- M= Cs, Rb, NH4 and X = S, Se are known to undergo superprotonic transitions to trigonal structures with very high **protonic conductivity** (.apprx. 10-2 Ω-1cm-1), making them very appealing as solid state **electrolytes** in **fuel cell.** Unfortunately, these compds. are reduced when used as **fuel cell electrolytes.** Interestingly, phosphate analogs exist, with general formula M+23(PO4)2, which exhibit nearly identical trigonal structures. Moreover, the superprotonic phosphate **CsH2PO4** has recently been shown to be stable under **fuel cell** operational conditions. Compds. with stoichiometry Ba+23-xK+1xHx (PO4)2, 0 <x < 1, were therefore synthesized to combine the trigonal structure and chemical stablity of Ba3(PO4)2 with the superprotonic conductivity of the M+13H(XO4) compds. Indeed, the **protonic conductivity** of the Ba+23-xK+1xHx (PO4)2 compds. increased by 1000 times compared to that of Ba3(PO4)2. However, the level of conductivity was still 100 times less than that expected for a superprotonic phase due to local order within the structure, to be detailed in the talk. Figure 6. Conductivity of pure Ba3(PO4)2 and three synthesized Ba3-xKxHx(PO4)2 compds.

L379 ANSWER 9 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:146193 Document No. 142:376429 Characterisation of intermediate **temperature** polyphosphate composites. Uma, T.; Tu, H. Y.; Freude, D.; Schneider, D.; Stimming, U. (Technische Universitaet Muenchen, Garching, D-85748, Germany). Journal of Materials Science, 40(1), 227-230 (English) 2005. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Springer.

AB Solid state **proton conductors** which show high conductivities in the medium **temperature** range (100 °C-200 °C) with low humidity are required as the **electrolyte** for polymer **electrolyte fuel cells** and direct methanol **fuel cells** operating in the **temperature** range. In the present work, amorphous ammonium silicon polyphosphate **electrolytes** were prepared from NH4H2PO4 (ammonium dihydrogen phosphate), (NH2)2CO (urea), and tetraethoxysilane by the sol-gel method and evaluated for use as **proton conductive** materials at intermediate **temps.** The formation of (NH4)2SiP4O13 was confirmed by powder X-ray diffraction. The particle size of (NH4)2SiP4O13 was in the range 4-7 μm. 31P MAS NMR measurements showed that the phosphorus chain length of about 300 phosphate-units in (NH4)2SiP4O13 decreases upon processing to a value of 5 for (NH4)2SiP4O13 and increased again after activation up to 50. After an initial mass loss (mostly NH3) of 3.5 % the material is thermally stable upon cycling between 50 °C and 300 °C. The conditioned conductivity values varied from 7.75 x 10-6 at 50 °C to 1.45 x 10-2 S cm-1 at 300 °C in dry nitrogen gas atmospheric

IT **61288-44-6P**, Ammonium silicon (tetraphosphate) ((NH4)2Si(P4O13))
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)

RN 61288-44-6 HCAPLUS

CN Ammonium silicon (tetraphosphate) ((NH4)2Si(P4O13)) (9CI) (CA INDEX

NAME)

Component	Ratio	Component Registry Number
O13P4	1	16132-64-2
H4N	2	14798-03-9
Si	1	7440-21-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST **fuel cell electrolyte** ammonium silicon polyphosphate composite cond
IT **Fuel cell electrolytes**
Heat treatment
(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)
IT Polyphosphates
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)
IT Phosphates, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(silico-, ammonium **salts**; characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)
IT **61288-44-6P**, Ammonium silicon (tetraphosphate) ((NH4)2Si(P4O13))
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)
IT 57-13-6, Urea, reactions 78-10-4, Tetraethoxysilane 7722-76-1, Ammonium phosphate (NH4H2PO4)
RL: RCT (Reactant); RACT (Reactant or reagent)
(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)

L379 ANSWER 10 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:108164 Document No. 142:357914 **Proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications. Hogarth, Warren H. J.; Diniz da Costa, Joao C.; Drennan, John; Lu, G. Q. (Australian Research Council (ARC), Centre for Functional Nanomaterials, University of Queensland, Brisbane, 4072, Australia). Journal of Materials Chemistry, 15(7), 754-758 (English) 2005. CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of Chemistry.
AB **Zirconium phosphate** was extensively studied as a **proton conductor** for proton exchange membrane (PEM) **fuel cell** applications. Here the authors report the synthesis of **mesoporous, templated** sol-gel **zirconium phosphate** for use in PEM applications in an effort to determine its suitability for use as a **surface** functionalized, solid acid **proton conductor** in the future. **Mesoporous zirconium phosphates** were synthesized using an acid-base pair mechanism with **surface** areas between 78 and 177 m2 g-1 and controlled pore sizes at 2-4 nm. TEM characterization confirmed the presence of a wormhole like pore

structure. The conductivity of such materials was up to 4.1 + 10-6 S cm-1 at 22 °C and 84% relative humidity (RH), while humidity reduction resulted in a conductivity decrease by more than an order of magnitude. High **temperature** testing on the samples confirmed their dependence on hydration for **proton conduction** and low hydroscopic nature. While the conductivity of these materials is low compared to Nafion, they may be a good candidate as a **surface** functionalized solid acid **proton conductor** due to their high **surface** area, porous structure and inherent ability to **conduct protons.**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 67, 76

ST **proton cond mesoporous** sol **zirconium phosphate fuel cell** membrane

IT Pore size
(controlled to 2-4 nm; **proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT Pore
(**mesopore; proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT Pore size distribution
Pore structure
Sol-gel processing
(**proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT **Fuel cells**
(proton exchange membrane, membrane materials for; **proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT **Ionic conductivity**
(**proton; proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT 691397-13-4, Pluronic P 123
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); REM (Removal or disposal); PROC (Process); USES (Uses)
(porogen, Pluronic P 123, F 108 and F 127; **proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT 1119-97-7, Tetradecyltrimethylammonium bromide
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); REM (Removal or disposal); PROC (Process); USES (Uses)
(porogen; **proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT 64-17-5, Ethanol, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT 13765-95-2P, **Zirconium phosphate**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

IT 7719-12-2, Phosphorus trichloride 52892-19-0

RL: RCT (Reactant); RACT (Reactant or reagent)
(**proton conductivity** of **mesoporous** sol-gel **zirconium phosphates** for **fuel cell** applications)

L379 ANSWER 11 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:75833 Document No. 142:138385 Hybrid organic-inorganic **proton conductors**, their manufacture, and membrane-electrode assemblies and **fuel cells** using them. Matsuo, Juho; Omichi, Takahiro (Teijin Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2005025945 A2 20050127, 25 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186541 20030630.

AB The **proton conductors** comprise organic polymer **proton conductors**, and inorg. **proton conductors** comprising condensates of phosphoric acids, Lewis acidic **metal** alkoxides, and Si oxide precursors, e.g., alkoxysilanes, where the organic and inorg. **proton conductors** form interpenetrating networks. In the manufacture, phosphoric acids were hydrolyzed and condensed with the alkoxides and the precursors in solvents, added to organic polymer **proton conductor** solns., and cast into **films.** The assemblies have the **proton conductors** sandwiched between catalyst electrodes containing **metals supported** on fine elec. conductive particles. The **proton conductors** show good flexibility, and oxidation and swelling resistance, resulting in **fuel cells** showing good dimensional stability.

IC ICM H01M008-02
ICS C08G079-14; C08J005-22; C08L081-06; C08L085-00; H01B001-06; H01B013-00; H01M004-86; H01M008-10; C08G075-23

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

ST hybrid org inorg **proton conductor** interpenetrating network **fuel cell**; phosphoric acid condensate **electrolyte fuel cell**; Lewis acid **metal** alkoxide condensate **electrolyte fuel cell**; alkoxysilane condensate **electrolyte fuel cell**

IT **Metal** alkoxides
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(Lewis acidic, condensates with solid acids and silicon oxide precursors; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT **Fuel cell** electrodes
Fuel cell electrolytes
Fuel cells
Hybrid organic-inorganic materials
(manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyether-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polyketones
Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyether-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel**

cells)
IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyketone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
IT **Ionic conductors**
(**protonic**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(elec. conductive particles, catalyst **supported** on; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
IT 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction product with phosphoric acid and **titanium** tetraisopropoxide 546-68-9DP, **Titanium** tetraisopropoxide, reaction products with phosphoric acid and alkoxysilanes 780-69-8DP, Phenyltriethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 7429-90-5DP, Aluminum, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7664-38-2DP, Phosphoric acid, reaction products with **titanium** tetraisopropoxide and alkoxysilanes 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

L379 ANSWER 12 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:75832 Document No. 142:138384 Hybrid organic-inorganic **proton conductors**, their manufacture, and membrane-electrode assemblies and **fuel cells** using them. Matsuo, Kazumine; Omichi, Takahiro (Teijin Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2005025943 A2 20050127, 29 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186535 20030630.
AB The **proton conductors** comprise organic polymer **proton conductors**, and inorg. **proton conductors** comprising condensates of 100 mol parts solid

acids, 450-20,000 mol parts Lewis acidic **metal** alkoxides, and Si oxide precursors, e.g., alkoxysilanes, where the organic and inorg. **proton conductors** form interpenetrating networks. In the manufacture, the solid acids were hydrolyzed and condensed with the alkoxides and the precursors in solvents, added to organic polymer **proton conductor** solns., and cast into **films.** The assemblies have the **proton conductors** sandwiched between catalyst electrodes containing **metals supported** on fine elec. conductive particles. The **proton conductors** show good flexibility, and oxidation and swelling resistance, resulting in **fuel cells** showing good dimensional stability.

IC ICM H01M008-02
ICS H01B001-06; H01B013-00; H01M004-86; H01M004-88; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

ST hybrid org inorg **proton conductor** interpenetrating network **fuel cell**; solid acid condensate **electrolyte fuel cell**; Lewis acid **metal** alkoxide condensate **electrolyte fuel cell**; alkoxysilane condensate **electrolyte fuel cell**

IT **Metal** alkoxides
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(Lewis acidic, condensates with solid acids and silicon oxide precursors; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT **Fuel cell** electrodes
Fuel cell electrolytes
Fuel cells
Hybrid organic-inorganic materials
(manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(molybdophosphoric, reaction products with Lewis acidic **metal** alkoxides, and silicon oxide precursors; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyether-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polyketones
Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyether-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyketone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT **Ionic conductors**
(**protonic**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(tungstophosphoric, reaction products with **titanium** tetraisopropoxide and alkoxysilanes; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(tungstosilicic, reaction products with tungstophosphoric acid, **titanium** tetraisopropoxide and alkoxysilanes; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(elec. conductive particles, catalyst **supported** on; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

IT 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction products with solid acids and **titanium** tetraisopropoxide 546-68-9DP, **Titanium** tetraisopropoxide, reaction products with solid acids and alkoxysilanes 780-69-8DP, Phenyltriethoxysilane, reaction product with tungstophosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 7429-90-5DP, Aluminum, alkoxides, reaction products with solid acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with solid acids and silicon oxide precursors 7664-38-2DP, Phosphoric acid, reaction products with solid acids, **titanium** tetraisopropoxide, and tetraethoxysilane 11104-88-4DP, Molybdophosphoric acid, reaction product with Lewis acidic **metal** alkoxides, and silicon oxide precursors 12067-99-1DP, Tungstophosphoric acid, reaction products with **titanium** tetraisopropoxide and alkoxysilanes 13598-36-2DP, Phosphonic acid, reaction product with heteropoly acids, Lewis acidic **metal** alkoxides, and silicon oxide precursors 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with tungstophosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with tungstophosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 827036-43-1DP, Silicon tungsten hydroxide oxide, reaction products with tungstophosphoric acid, **titanium** tetraisopropoxide, and alkoxysilanes

RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

L379 ANSWER 13 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:16056 Document No. 142:117647 **Fuel cells** and their components using catalysts having a high **metal** to **support** ratio. Kourtakis, Kostantinos (E. I. du Pont de Nemours and Company, USA). PCT Int. Appl. WO 2005001978 A2 20050106, 36 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-US16707 20040527. PRIORITY: US 2003-PV475075 20030530.

AB The present invention relates to **coated** substrates comprising electrocatalysts containing at least about 70 weight% of a **metal.** The present invention also relates to **fuel cell** stacks and single cells, including direct methanol **fuels cells**, hydrogen **fuel cells**, and reformed hydrogen **fuel cells** comprising the **coated** substrate comprising electrocatalysts containing at least about 70 weight% of a **metal.**

IT **7440-05-3, Palladium**, uses
RL: CAT (Catalyst use); USES (Uses)
(**fuel cells** and their components using catalysts having high **metal** to **support** ratio)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** catalyst high **metal** **support** ratio

IT Carbides
Oxides (inorganic), uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
(composites; **fuel cells** and their components using catalysts having high **metal** to **support** ratio)

IT **Fuel cells**
(direct methanol; **fuel cells** and their components using catalysts having high **metal** to **support** ratio)

IT Catalysts
(electrocatalysts; **fuel cells** and their components using catalysts having high **metal** to **support** ratio)

IT Carbon fibers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fabrics; **fuel cells** and their components using catalysts having high **metal** to **support** ratio)

IT Conducting polymers
Fuel cells

(**fuel cells** and their components using
catalysts having high **metal** to **support** ratio)
IT Transition **metal** carbides
RL: CAT (Catalyst use); TEM (Technical or engineered material use);
USES (Uses)
(**fuel cells** and their components using
catalysts having high **metal** to **support** ratio)
IT Polymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**ion**-exchange; **fuel cells** and their
components using catalysts having high **metal** to
support ratio)
IT **Metalloporphyrins**
RL: CAT (Catalyst use); USES (Uses)
(**iron**; **fuel cells** and their
components using catalysts having high **metal** to
support ratio)
IT **Metalloporphyrins**
RL: CAT (Catalyst use); USES (Uses)
(**nickel**; **fuel cells** and their
components using catalysts having high **metal** to
support ratio)
IT Carbon fibers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(paper; **fuel cells** and their components using
catalysts having high **metal** to **support** ratio)
IT Sulfonic acids, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(perfluoro; **fuel cells** and their components
using catalysts having high **metal** to **support**
ratio)
IT Perfluoro compounds
RL: TEM (Technical or engineered material use); USES (Uses)
(sulfonic acids; **fuel cells** and their
components using catalysts having high **metal** to
support ratio)
IT **Ion** exchange membranes
(**support**; **fuel cells** and their
components using catalysts having high **metal** to
support ratio)
IT 132-16-1, **Iron** phthalocyanine 3317-67-7, Cobalt
phthalocyanine 7439-98-7, Molybdenum, uses **7440-05-3**,
Palladium, uses 7440-06-4, Platinum, uses 7440-16-6,
Rhodium, uses 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten,
uses 12779-05-4 14055-02-8, **Nickel** phthalocyanine
15612-49-4, Cobalt porphyrin
RL: CAT (Catalyst use); USES (Uses)
(**fuel cells** and their components using
catalysts having high **metal** to **support** ratio)
IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use);
USES (Uses)
(**fuel cells** and their components using
catalysts having high **metal** to **support** ratio)

L379 ANSWER 14 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:1036049 Document No. 142:25858 Direct-type polymer
electrolyte fuel cell with anode
containing oxidation catalyst. Yanase, Takanori; Iwasaki, Fumiharu;
Tamachi, Tsuneaki; Sarada, Takashi; Furuta, Kazuyoshi (Seiko
Instruments, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2004342435 A2
20041202, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
2003-136905 20030515.
AB The claimed **fuel cell** is equipped with an anode
containing an electrochem. oxidation catalyst for a **metal** complex
hydride fuel, where the catalyst decomps. the fuel to give a

cation and oxidizes a byproduct H gas to give H2O. The
anode catalyst may contain (1) Co and/or a H-absorbing alloy and
Ni, **Pd**, and/or Pt or (2) C-**supported**
Ni, **Pd**, and/or Pt. The **fuel**
cell provides suppressed generation of H gas reaction
products and improved handling property of fuels, e.g., NaBH4.

IT **7440-02-0**, **Nickel**, uses **7440-05-3**,
Palladium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(catalyst; anode catalyst for direct borohydride polymer
electrolyte fuel cell)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-90
ICS H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST anode oxidn catalyst direct borohydride polymer **electrolyte**
fuel cell

IT **Fuel cell** anodes
Oxidation catalysts
(anode catalyst for direct borohydride polymer
electrolyte fuel cell)

IT **Fuel cells**
(polymer **electrolyte**; anode catalyst for direct
borohydride polymer **electrolyte fuel**
cell)

IT 16940-66-2, Sodium tetrahydroborate
RL: TEM (Technical or engineered material use); USES (Uses)
(anode catalyst for direct borohydride polymer
electrolyte fuel cell)

IT **7440-02-0**, **Nickel**, uses **7440-05-3**,
Palladium, uses 7440-06-4, Platinum, uses 7440-48-4,
Cobalt, uses 799854-37-8
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(catalyst; anode catalyst for direct borohydride polymer
electrolyte fuel cell)

L379 ANSWER 15 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:1020207 Document No. 142:9228 Solid oxide **fuel**
cell and method for producing same. Shibutani; Satoshi;
Okada, Yukihiro; Yuasa, Kohji; Taniguchi, Noboru; Mino, Norihisa;
Niikura, Junji (Matsushita Electric Industrial Co., Ltd., Japan).
PCT Int. Appl. WO 2004102704 A1 20041125, 53 pp. DESIGNATED STATES:
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH,
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM,
PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ,
CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU,
MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese). CODEN:
PIXXD2. APPLICATION: WO 2004-JP6772 20040513. PRIORITY: JP
2003-136344 20030514.

AB A solid oxide **fuel cell** is disclosed which is excellent in electricity generation characteristics even at lower **temps**. (for example, in the range from 200°C to 600°C, preferably in the range from 400°C to 600°C). A method for producing such a solid oxide **fuel cell** is also disclosed. The solid oxide **fuel cell** comprises an anode, a cathode, and a first solid oxide which is held between the anode and the cathode. The anode contains a **metal** particle (2), an anode catalyst (1) and an **ion conductor** (3), and the anode catalyst (1) is adhered to the **surface** of the **metal** particle (2). The first solid oxide and the **ion conductor** (3) resp. have an **ion** conductivity selected from oxide-**ion** conductivity and hydrogen-**ion** conductivity

IT **7440-02-0**, **Nickel**, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support** for **metal** catalysts for **fuel cells**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT **386720-65-6**, Barium cerium gadolinium zirconium oxide ($BaCe0.2Gd0.2Zr0.6O3$)
RL: TEM (Technical or engineered material use); USES (Uses)
(**ion conductors** for **fuel cells**)

RN 386720-65-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide ($BaCe0.2Gd0.2Zr0.6O3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IT **7440-05-3**, **Palladium**, uses **7440-22-4**, **Silver**, uses
RL: CAT (Catalyst use); USES (Uses)
(**nickel supported** catalysts for **fuel cells**)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **ion** conductive **metal** oxide **fuel**
cell anode catalyst
IT **Ionic conductors**
(solid oxide **fuel cells** containing **metal**
oxide type)
IT Catalysts
(solid oxide **fuel cells** containing **metal**
-supported)
IT **Fuel cells**
(solid oxide; **metal** oxide **ion**
conductors and catalysts form)
IT **7440-02-0**, **Nickel**, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support** for **metal** catalysts for
fuel cells)
IT 162105-72-8, Cerium samarium oxide (Ce0.8Sm0.2O2) 183546-68-1,
Cerium gadolinium oxide (Ce0.9Gd0.1O2) 258347-94-3, Cerium
lanthanum oxide (Ce0.9La0.1O2) **386720-65-6**, Barium
cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3)
797816-90-1
RL: TEM (Technical or engineered material use); USES (Uses)
(**ion conductors** for **fuel**
cells)
IT 7439-88-5, Iridium, uses 7439-89-6, **Iron**, uses
7440-05-3, **Palladium**, uses 7440-06-4, Platinum,
uses 7440-16-6, Rhodium, uses **7440-22-4**, **Silver**
, uses 7440-48-4, Cobalt, uses 7440-57-5, Gold, uses
12714-36-2 37365-43-8 39361-20-1 77491-76-0 252010-68-7
RL: CAT (Catalyst use); USES (Uses)
(**nickel supported** catalysts for **fuel**
cells)

L379 ANSWER 16 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:965172 Document No. 141:368468 Manufacture of **metal**
hydrides and their use for hydrogen storage in fuel cells.
Edwards, Peter Philip; Grochala, Wojciech; Book, David; Harris, Ivor
Rex (Isis Innovation Limited, UK). PCT Int. Appl. WO 2004096700 A1
20041111, 21 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,
YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK,
ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN,
TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-GB1579
20040413. PRIORITY: GB 2003-8253 20030410.
AB **Metal hydrides** are produced by mech. grinding or
milling an oxide or halide of a 1st **metal** with a
hydride of a 2nd **metal**, especially NaH, NaBH4, or
LiAlH4. The reacting particles have a particle size of ≤ 50
.mu.m, preferably 5-40 **.mu.m**
. The produced **metal hydride** can be used for
hydrogen storage to supply hydrogen **fuel** to **fuel**
cells, especially polymeric-**electrolyte**-membrane or alkaline
fuel cells. An elec. energy generating system
consists of a hydrogen **fuel cell** having an inlet
for hydrogen gas; and a storage vessel containing the solid
metal hydride material being connected to the
inlet of the hydrogen **fuel cell**, wherein the
solid **metal hydride** material thermally decomps.
to release hydrogen gas at a **temperature** within the operating
range of the hydrogen **fuel cell**
(60-120°). The hydrogen storage material can be Zn(BH4)2,
NaBH4, MgH2, and/or AlH3.
IC ICM C01B006-00

ICS C01B006-21; H01M008-06; B60L011-18
CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **metal hydride** zinc borohydride manuf hydrogen
storage fuel cell
IT Fuel cells
(alkaline fuel cells; manufacture of **metal hydrides**
and their use for hydrogen storage in fuel cells)
IT Ball milling
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT **Fuel cells**
(polymer **electrolyte**; manufacture of **metal**
hydrides and their use for hydrogen storage in
fuel cells)
IT 17611-70-0P, Zinc borohydride
RL: CPS (Chemical process); IMF (Industrial manufacture); NUU (Other
use, unclassified); PEP (Physical, engineering or chemical process);
PREP (Preparation); PROC (Process); USES (Uses)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT 7693-27-8, Magnesium **hydride** (MgH2) 7784-21-6, Aluminum
hydride (AlH3)
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP
(Physical, engineering or chemical process); PROC (Process); USES
(Uses)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT 1314-13-2, Zinc oxide, reactions 7646-85-7, Zinc chloride,
reactions 16940-66-2, Sodium borohydride
RL: CPS (Chemical process); PEP (Physical, engineering or chemical
process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)

L379 ANSWER 17 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:934657 Document No. 141:398175 **Metal-supported**
porous carbon **films** as **fuel cell**
electrodes. Ohya, Shyusei; Fujii, Yuuichi; Matsuo, Makoto; Takagi,
Jun (Ube Industries, Ltd., Japan). PCT Int. Appl. WO 2004095614 A2
20041104, 27 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU,
ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES,
FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD,
TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-JP5092
20040408. PRIORITY: JP 2003-113978 20030418.
AB The invention concerns a **metal-supported** porous
carbon **film** wherein **metal** fine particles with a
mean particle diameter of 0.7-20 nm are dispersed and **supported**
on pore **surface** walls, **fuel cell**
electrodes employing the **metal-supported** porous
carbon **film**, a membrane-electrode assembly comprising the
fuel cell electrodes bonded on both **sides**
of a polymer **electrolyte film**, and a
fuel cell comprising the **fuel**
cell electrode as a constituent element. The
support structure is such that **metal** fine
particles having a controlled particle size are uniformly
supported to allow effective utilization of the
metal-based catalyst, and the fabrication steps are simple.
IT **7440-05-3, Palladium**, uses **7440-05-3D**,
Palladium, compound
RL: CAT (Catalyst use); USES (Uses)

(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST **fuel cell** electrode **metal**
supported porous carbon **film**
IT Polyimides, uses
RL: DEV (Device component use); USES (Uses)
(carbonized product; **metal-supported** porous
carbon **films** as **fuel cell**
electrodes)
IT Polyoxyalkylenes, uses
RL: MOA (Modifier or additive use); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**; **metal-**
supported porous carbon **films** as **fuel**
cell electrodes)
IT **Fuel cell** electrodes
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT **Metals**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT Fluoropolymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**;
metal-supported porous carbon **films**
as **fuel cell** electrodes)
IT **Ionomers**
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; **metal-**
supported porous carbon **films** as **fuel**
cell electrodes)
IT **7440-05-3**, **Palladium**, uses **7440-05-3D**,
Palladium, compound
RL: CAT (Catalyst use); USES (Uses)
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT 7440-06-4, Platinum, uses 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT 785808-93-7, Nafion 11
RL: MOA (Modifier or additive use); USES (Uses)
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT 785785-69-5, TPX 205MU 785785-70-8, TPX 205R
RL: TEM (Technical or engineered material use); USES (Uses)
(**metal-supported** porous carbon **films**
as **fuel cell** electrodes)
IT 7782-42-5, Graphite, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; **metal-supported** porous
carbon **films** as **fuel cell**
electrodes)

L379 ANSWER 18 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:898951 Document No. 141:368429 Unit **cell** structure for
fuel cell, and its use in solid oxide **fuel**
cell. Hara, Naoki; Takeuchi, Kazushi; Shibata, Itaru
(Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP
2004303508 A2 20041028, 16 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2003-93400 20030331.

AB The unit cell structure has a **metal sheet** sandwiched between 2 unit cells. The unit cell has battery components or an **electrolyte layer** and an anode or cathode **layer** on upper **side** of a **metal support** having (1) ≥1 pore with opening at upper and lower **sides** or (2) ≥1 depressed section at lower **side** and pores at the depressed section bottom. The same kind electrode **layers** (i.e., anode to anode, cathode to cathode) of the 2 unit cells are **faced** through the **metal sheet**, and the **sheet** has ≥1 hole penetrating through upper and lower **sides.** Preferably, the **metal support** contains **Fe, Ni**, and/or **Cu.** The **fuel cell** has a stack of the unit cell structure, wherein an insulating part is placed at the **metal support** and/or the **metal sheet**, and each unit cell structure has current collectors at the anode **side** and the cathode **side.** The unit cell structure with high reliability of the same electrode **faced** part gives a small-sized lightwt. **fuel cell.**

IT **7440-02-0, Nickel**, uses **7440-50-8, Copper**, uses
RL: DEV (Device component use); USES (Uses)
(**support** containing; unit cell structure with **metal**
sheet sandwiched between two unit cells on **metal**
supports for solid oxide **fuel cell**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **7440-22-4, Silver**, uses
RL: DEV (Device component use); USES (Uses)
(**support**; unit cell structure with **metal**
sheet sandwiched between two unit cells on **metal**
supports for solid oxide **fuel cell**)

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M008-02
ICS H01M008-12; H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid oxide **fuel cell** unit **cell**
structure; **metal support sheet** unit
cell structure **fuel cell**
IT Electric insulators
(ceramic, **fuel cell** component; unit cell
structure with **metal sheet** sandwiched between
two unit cells on **metal supports** for solid
oxide **fuel cell**)
IT **Fuel cells**
(solid oxide; unit cell structure with **metal**
sheet sandwiched between two unit cells on **metal**
supports for solid oxide **fuel cell**)
IT 11109-52-7, SUS 430 39323-81-4, Invar
RL: DEV (Device component use); USES (Uses)
(**sheet**, current collector; unit cell structure with
metal sheet sandwiched between two unit cells
on **metal supports** for solid oxide
fuel cell)
IT 12606-02-9, Inconel 39362-79-3, 42 **Alloy**
RL: DEV (Device component use); USES (Uses)
(**sheet**, **support**; unit cell structure with
metal sheet sandwiched between two unit cells
on **metal supports** for solid oxide
fuel cell)
IT 7439-89-6, **Iron**, uses **7440-02-0**, **Nickel**
, uses **7440-50-8**, **Copper**, uses
RL: DEV (Device component use); USES (Uses)
(**support** containing; unit cell structure with **metal**
sheet sandwiched between two unit cells on **metal**
supports for solid oxide **fuel cell**)
IT **7440-22-4**, **Silver**, uses
RL: DEV (Device component use); USES (Uses)
(**support**; unit cell structure with **metal**
sheet sandwiched between two unit cells on **metal**
supports for solid oxide **fuel cell**)

L379 ANSWER 19 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:820264 Document No. 141:317228 **Fuel cell**
units and their manufacture. Takeuchi, Kazushi; Hara, Naoki;
Shibata, Itaru (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo
Koho JP 2004281172 A2 20041007, 14 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2003-69480 20030314.
AB The **fuel cell** units have an **electrolyte**
and an anode **layer** or a cathode **layer** on a
metal support, where the **metal**
support has a recessed area of any pattern on the opposite
side from the **electrolyte layer**, a
porous area at the bottom of the recessed area, and a porous gas
permeable reinforcing member at the bottom of the recessed area,.
The **support** is a **metal** containing **Fe**,
Ni, **Cu**, **Cr**, Mo, and/or W. The units are
prepared by forming the **electrolyte layer** and the
electrode **layer** successively on the **metal**
support, forming the recessed area on the backside of the
support, making the bottom part of the recessed area porous,
and adding the gas permeable reinforcing member to the bottom.
IT **7440-02-0**, **Nickel**, uses
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(structure and manufacture of **fuel cell** units
containing **metal supports** having recessed areas
with porous bottoms and gas permeable reinforcing members)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell metal** separator structure
manuf
IT **Fuel cells**
(structure and manufacture of **fuel cell** units
containing **metal supports** having recessed areas
with porous bottoms and gas permeable reinforcing members)
IT 1344-28-1, Alumina, uses **7440-02-0**, **Nickel**, uses
7440-18-8, Ruthenium, uses 12605-84-4, Hastelloy B 12606-02-9,
Inconel 39362-79-3, 42 **Alloy** 113482-02-3, Yttrium
zirconium oxide (Y0.06Zr0.97O2.03) 114168-16-0, Yttrium zirconium
oxide (Y0.16Zr0.92O2.08)
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(structure and manufacture of **fuel cell** units
containing **metal supports** having recessed areas
with porous bottoms and gas permeable reinforcing members)

L379 ANSWER 20 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:803048 Document No. 141:317212 **Fuel cell.**
Taniguchi, Noboru (Matsushita Electric Industrial Co., Ltd., Japan).
PCT Int. Appl. WO 2004084332 A1 20040930, 45 pp. DESIGNATED
STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,
CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB,
GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO,
NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE,
BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE,
IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese).
CODEN: PIXXD2. APPLICATION: WO 2004-JP3392 20040315. PRIORITY: JP
2003-72702 20030317.
AB The **fuel cell** comprises an **electrolyte**
between an anode and a cathode, a fuel supply part supplying a fuel
to the anode, an oxidizing agent supply part supplying an O containing
oxidizing agent to the cathode, and a heating part heating the
fuel cell; where the **electrolyte** is made
of a solid oxide; and the fuel is liquid or solid at ordinary
temperature and normal pressure.
IT **386720-65-6D**, Barium cerium gadolinium zirconium oxide
(BaCe0.2Gd0.2Zr0.6O3), O deficient **632286-96-5D**, Barium
cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3), O
deficient **632286-97-6D**, Barium cerium gadolinium zirconium
oxide (BaCe0.24Gd0.2Zr0.56O3), O deficient
RL: DEV (Device component use); USES (Uses)
(**fuel cells** containing heating means and solid
oxides in **electrolytes**)
RN 386720-65-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba	1	7440-39-3

RN 632286-96-5 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-02
ICS H01M008-04; H01M008-06; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** structure heating means **electrolyte** solid oxide
IT **Fuel cell electrolytes**
Fuel cells
(**fuel cells** containing heating means and solid oxides in **electrolytes**)
IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); USES (Uses)
(**fuel cells** containing heating means and solid oxides in **electrolytes**)
IT 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 71-23-8, Propyl alcohol, uses 71-36-3, Butyl alcohol, uses 106-97-8, Butane, uses 144378-46-1D, Barium cerium gadolinium oxide (BaCe0.8Gd0.2O3), O deficient 288865-89-4D, Barium cerium yttrium zirconium oxide (BaCe0.4Y0.2Zr0.4O3), O deficient 288866-24-0D, Barium cerium indium zirconium oxide (BaCe0.4In0.2Zr0.4O3), O deficient 288866-28-4D, Barium cerium indium zirconium oxide (BaCe0.5In0.2Zr0.3O3), O deficient **386720-65-6D**, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3), O deficient 632286-92-1D, Barium cerium ytterbium zirconium oxide (BaCe0.4Yb0.2Zr0.4O3), O deficient 632286-93-2, Aluminum barium cerium gadolinium oxide (Al0.02BaCe0.8Gd0.2O3) 632286-94-3D, Aluminum barium cerium indium zirconium oxide (Al0.02BaCe0.4In0.2Zr0.4O3), O deficient **632286-96-5D**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3), O deficient **632286-97-6D**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3), O deficient 632286-98-7D, O deficient 767287-96-7D, O deficient
RL: DEV (Device component use); USES (Uses)
(**fuel cells** containing heating means and solid oxides in **electrolytes**)

L379 ANSWER 21 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:788704 Document No. 142:184185 Process for preparation of **supported** platinum and Pt-based multi-element catalyst

organic sol. Tang, Yawen; Lu, Tianhong; Yang, Hui (Nanjing Normal University, Peop. Rep. China). Faming Zhuanli Shenqing Gongkai Shuomingshu CN 1410160 A 20030416, 7 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2002-138658 20021126.

AB The title process comprises the following steps of (1) dissolving Pt and Pt-based multi-element **salt** or acid compound into organic solvent, adding organic solution of SnCl2 under stirring, allowing to react for 5 min to obtain organic sol of the **metal salt** ; (2) adding **support** to the component A at -25-65°C, allowing to react under N2 protection; and (3) washing with NaOH or Na2CO3 solution, acid and water till no Cl **ion** is detectable, and drying at 60-150°C to obtain the catalyst. The other **metal** is from Ru, Ir, Rh or Os; and the **support** from activated carbon, carbon black or mol. sieve. This catalyst is used in proton-exchange membrane **fuel cell.**

IT **7772-99-8**, Tin dichloride, uses
RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

RN 7772-99-8 HCAPLUS

CN Tin chloride (SnCl2) (8CI, 9CI) (CA INDEX NAME)

Cl— Sn— Cl

IC ICM B01J023-42
ICS B01J037-02

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 52

IT Redox reaction catalysts
(preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT Fuel cells
(proton exchange membrane; preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT 7440-44-0, Activated carbon, uses
RL: CAT (Catalyst use); USES (Uses)
(activated; preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT 7439-88-5, Iridium, uses 7440-04-2, Osmium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
RL: CAT (Catalyst use); USES (Uses)
(preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT **7772-99-8**, Tin dichloride, uses 16941-12-1, Chloroplatinic acid
RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

L379 ANSWER 22 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:584211 Document No. 141:413488 **Metal-supported** solid oxide **fuel cells** for operation at **temperatures** of 500-650.**degree.C.**
Atkinson, A.; Baron, S.; Brandon, N. P.; Esquirol, A.; Kilner, J. A.; Oishi, N.; Rudkin, R.; Steele, B. C. H. (Centre for Ion Conducting Membranes, Imperial College London, SW7 2BP, UK). Fuel Cell Science, Engineering and Technology, International Conference on Fuel Cell Science, Engineering and Technology, 1st, Rochester, NY, United States, Apr. 21-23, 2003, Meeting Date 2003, 499-506. Editor(s): Shah, Ramesh K.; Kandlikar, S. G. American Society of Mechanical Engineers: New York, N. Y. ISBN: 0-7918-3668-1 (English) 2003. CODEN: 69FQKI.

AB Innovative intermediate **temperature** solid oxide **fuel cells** were developed which involved the fabrication of a thick-**film** PEN structure **supported** on a ferritic stainless steel substrate. Use of a **metal support** enables a robust structure to be fabricated which can withstand stresses during operation. It is possible to arrange a processing schedule that allows the deposited **electrolyte** powder to be sintered into an impermeable thick **film** (10-20 .**mu.m**) at .apprx.1000°. This relatively low sintering **temperature** is compatible with the mech. integrity of the stainless steel **support.** An anode **film** is initially deposited on the **metal support** followed by deposition of the **electrolyte** powder. Much of the initial development work was carried out using ceria-based **electrolytes.** The cell is completed by depositing a cathode. Results are presented on the development and characterization of anode and cathode materials with a discussion on cell development.

IT **7440-02-0, Nickel,** uses
RL: DEV (Device component use); USES (Uses)
(composite material containing cerium gadolinium oxide and; stainless steel-**supported SOFCs** for operation at 500-650°)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST stainless steel **support** solid oxide **fuel cell**
IT **Fuel cells**
(solid oxide; stainless steel-**supported SOFCs** for operation at 500-650°)
IT 61162-99-0, Cobalt **iron lanthanum** strontium oxide
RL: DEV (Device component use); USES (Uses)
(cathode; in stainless steel-**supported SOFCs** for operation at 500-650°)
IT 152233-89-1, Cerium gadolinium oxide (Ce0.9Gd0.1O1.95)
RL: DEV (Device component use); USES (Uses)
(composite material containing **Ni** and; in stainless steel-**supported SOFCs** for operation at 500-650°)
IT **7440-02-0, Nickel,** uses
RL: DEV (Device component use); USES (Uses)
(composite material containing cerium gadolinium oxide and; stainless steel-**supported SOFCs** for operation at 500-650°)
IT 152233-89-1D, Cerium gadolinium oxide (Ce0.9Gd0.1O1.95),

oxygen-deficient
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; in stainless steel-**supported** **SOFCs** for operation at 500-650°)
IT 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); USES (Uses)
(ferritic; stainless steel-**supported** **SOFCs** for operation at 500-650°)

L379 ANSWER 23 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:552141 Document No. 141:74332 Compact fuel cell having system for dehydrogenation of organic **hydrides** inside for efficient power generation. Ichikawa, Masaru; Sasazu, Hiroshi; Suzuki, Fumihiko (Electric Power Development Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004192834 A2 20040708, 11 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-356074 20021206.
AB The **fuel cell** consists of a cathode reactor filled with an oxidizing agent, an anode reactor having a holder for organic **hydrides**, a dehydrogenation catalyst, and a heater, sealed with a H separator membrane, and an **ion**-exchange membrane between a cathode current collector and an anode current collector, each having a Pt catalyst, wherein H **ion** is formed by dehydrogenation of organic **hydrides**, separation of the resulting H with the H separator membrane, and **ionization** of the H in contact with the Pt catalyst **supported** on the anode current collector, and passed through the **ion** -exchange membrane for reaction with O **ion** in the cathode reactor.
IT **7439-89-6**, **Iron**, uses **7440-02-0**, **Nickel**, uses **7440-05-3**, **Palladium**, uses **7440-47-3**, **Chromium**, uses **7440-50-8**, **Copper**, uses **7440-62-2**, **Vanadium**, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM H01M008-04
ICS H01M008-06; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell org **hydride** dehydrogenation catalyst hydrogen; isopropanol hydrogenation oxygen fuel cell platinum catalyst
IT Carbon fibers, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(activated; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Polymers, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aromatic, hydrogenated; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Nanotubes
(carbon; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Catalyst **supports**
Dehydrogenation catalysts
Fuel cells
Heaters
(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Fullerenes
Zeolites (synthetic), uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Aromatic compounds
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hydrogenated; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT Porous materials
(**mesoporous**; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT **Hydrides**
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(organic; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)
IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7439-88-5, Iridium, uses **7439-89-6, Iron**, uses 7439-98-7, Molybdenum, uses **7440-02-0, Nickel**, uses **7440-05-3, Palladium**, uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten, uses **7440-47-3, Chromium**, uses 7440-48-4, Cobalt, uses **7440-50-8, Copper**, uses **7440-62-2, Vanadium**, uses 7631-86-9, Silica, uses 13463-67-7, Titania, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)

(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)

IT 1333-74-0P, Hydrogen, preparation
RL: CPS (Chemical process); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)

IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-36-3, Butyl alcohol, uses 7722-84-1, Hydrogen peroxide, uses 7782-44-7, Oxygen, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(compact fuel cell having system for dehydrogenation of organic **hydrides** inside)

IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(nanotubes; compact fuel cell having system for dehydrogenation of organic **hydrides** inside)

L379 ANSWER 24 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:545609 Document No. 142:338902 Characteristics of anode-**supported** flat tubular solid oxide fuel cell. Kim, Jong-Hee; Song, Rak-Hyun (Hydrogen Fuel Cells Research Department, Korea Institute of Energy Research, Dajeon, 305-343, S. Korea). Journal of the Korean Electrochemical Society, 7(2), 94-99 (Korean) 2004. CODEN: JKESFC. ISSN: 1229-1935. Publisher: Korean Electrochemical Society.

AB Anode-**supported** flat tubular solid oxide **fuel cells** (**SOFC**) were studied for an increase of the cell power d. The anode-**supported** flat tube was fabricated by extrusion. The porosity and pore size of Ni/YSZ (8 mol% yttria-stabilized zirconia) cermet anode were 50.6% and 0.23 **mu.m**, resp. The Ni particles in the anode were distributed uniformly and connected well to other particles in the cermet anode. The YSZ **electrolyte layer** and multilayered cathode composed of LSM ($(La_{0.85}Sr_{0.15})_{0.9}MnO_3$)/YSZ composite, LSM, and LSCF($La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$) were **coated** onto the anode substrate by slurry dip **coating.** The anode-**supported** flat tubular cell showed a performance of 300 mW/cm2 (0.6 V, 500 mA/cm2) at 800°. The electrochem. characteristics of the flat tubular cell were examined by a.c. impedance and humidified **fuel** enhanced **cell** performance. The areal sp. resistance of LSM-**coated** (slurry dipping) steel, SUS430, as **metallic** interconnect, was 148 mΩ·cm2 at 750° and then decreased to 43 mΩ·cm2 after 450 h. However LSM- **coated** (slurry dipping) Fecralloy had a high **area sp. resistance.**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST anode **supported** flat tubular solid state fuel cell
IT **Fuel cells**
(solid **electrolyte**, tubular; characteristics of anode-**supported** flat-tubular solid oxide **fuel cells**)

IT 185227-83-2
RL: DEV (Device component use); USES (Uses)
(anode; characteristics of anode-**supported** flat-tubular solid oxide fuel cells)

IT 148595-66-8, Cobalt iron lanthanum strontium oxide ($Co_{0.2}Fe_{0.8}La_{0.6}Sr_{0.4}O_3$) 149372-30-5, Lanthanum manganese strontium oxide ($La_{0.76}MnSr_{0.14}O_3$)
RL: DEV (Device component use); USES (Uses)
(cathode containing; characteristics of anode-**supported** flat-tubular solid oxide fuel cells)

IT 114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; characteristics of anode-**supported** flat-tubular solid oxide **fuel cells**)
IT 11109-52-7, SUS430 58719-23-6, Fecralloy
RL: DEV (Device component use); USES (Uses)
(interconnect; characteristics of anode-**supported** flat-tubular solid oxide fuel cells)

L379 ANSWER 25 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:532102 Document No. 141:150136 Nafion based amperometric hydrogen sensor. Velayutham, G.; Ramesh, C.; Murugesan, N.; Manivannan, V.; Dhathathreyan, K. S.; Periaswami, G. (Centre For Electrochemical & Energy Research, SPIC Science Foundation, Chennai, 600 032, India). Ionics, 10(1 & 2), 63-67 (English) 2004. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.
AB A Nafion based amperometric H sensor that operates at room **temperature** was developed. The **electrolyte** used in the sensor is Nafion 117, which is a **proton conducting** solid polymer **electrolyte.** Pd catalyst was used on the sensing **side** and Pt **supported** on C on the air **side.** The sensor functions as **fuel cell** , H2/Pd // Nafion // Pt/O2 and the short circuit current is measured. The short circuit current is linear with respect to concentration of H on the sensing **side.** The sensor is able to detect the concentration of H in Ar down to ppb level. Details of assembly of the sensor, response behavior and applications are discussed.
CC 79-2 (Inorganic Analytical Chemistry)
Section cross-reference(s): 72

L379 ANSWER 26 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:507627 Document No. 141:56590 Hydrogen-permeable **alloy** membrane, and hydrogen-permeable component and production of same.. Ando, Isao (Sumitomo Metal Mining Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004174373 A2 20040624, 12 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-343547 20021127.
AB The H-permeable **alloy** membrane is **metal** membrane containing face centered cubic crystalline structure **Pd** or **Pd alloy** as main composition and B 1-20 atomic%, and it is characterized by having face centered cubic crystalline structure lattice constant (room **temperature**) ≥ 0.390 nm. The **Pd alloy** may further contain **Cu, Ag** and/or Au 0-50 atomic%. The **Pd alloy** may also contain Y and/or lanthanoid element 0-10 atomic%. The H-permeable component is provided by forming the H-permeable **alloy** membrane on a gas-permeable porous **metal** (e.g., SUS316L) **support** . The production method includes forming the H-permeable **alloy** membrane on a gas-permeable porous **metal support** by **ion** plating, sputtering, applying **alloy** slurry, electroless plating or electroplating, or **alloy** rolling, etc. The H-permeable **alloy** membrane and H-permeable component can be used for purification/separation of H from gas mixture, and the purified/separated H can be used for **fuel cells.**
IT **7440-05-3, Palladium**, properties
RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(membrane containing; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM B01D071-02
ICS B01D053-22; B22F003-11; C01B003-56; C22C001-08; C22C005-04;
C23C014-14; C23C014-32; C23C014-34; H01M008-06
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST hydrogen permeable **alloy** membrane; component hydrogen
permeable prodn; **fuel cell** hydrogen permeable
alloy membrane component
IT Membranes, nonbiological
(**alloy**, hydrogen-permeable; hydrogen-permeable
alloy membrane and hydrogen-permeable component and
production of same)
IT **Coating** process
(electroless; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT Vapor deposition process
(electron-beam; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT Crystal structure types
(face centered cubic, of **palladium Pd Ag** B;
hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT Electrodeposition
Rolling (**metals**)
Sputtering
(hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT **Fuel cells**
(hydrogen-permeable **alloy** membrane and
hydrogen-permeable component for purification/separation of hydrogen for)
IT Vapor deposition process
(ion plating; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT **Alloys**, properties
RL: DEV (Device component use); NUU (Other use, unclassified); PRP
(Properties); USES (Uses)
(membrane, hydrogen-permeable; hydrogen-permeable **alloy**
membrane and hydrogen-permeable component and production of same)
IT Vapor deposition process
(vacuum; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT **Palladium alloy**, base
RL: DEV (Device component use); NUU (Other use, unclassified); PRP
(Properties); USES (Uses)
(membrane containing; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT **7440-05-3, Palladium**, properties
RL: DEV (Device component use); NUU (Other use, unclassified); PRP
(Properties); USES (Uses)
(membrane containing; hydrogen-permeable **alloy** membrane and
hydrogen-permeable component and production of same)
IT 39309-40-5 86511-28-6, **Palladium alloy,**
Pd,B 706809-22-5 706809-23-6
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(membrane, hydrogen-permeable; hydrogen-permeable **alloy**
membrane and hydrogen-permeable component and production of same)
IT 11134-23-9, SUS316L
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(porous **support**; hydrogen-permeable **alloy**
membrane and hydrogen-permeable component and production of same)
IT 1333-74-0, Hydrogen, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical
process); PROC (Process)
(purification/separation of; hydrogen-permeable **alloy** membrane
and hydrogen-permeable component and production of same for)

L379 ANSWER 27 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:484924 Document No. 141:280243 Effect of CeO_2 interlayer on ZrO_2 **electrolyte**/La(Sr)CoO_3 cathode for low-**temperature** **SOFCs**. Shiono, Mitsunobu; Kobayashi, Kenichi; Lan Nguyen, Tuong; Hosoda, Kan; Kato, Toru; Ota, Kenichiro; Dokiya, Masayuki (Graduate School of Environment and Information Sciences, Yokohama National University, Yokohama, Hodogaya, 240-8501, Japan). Solid State Ionics, 170(1-2), 1-7 (English) 2004. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Porous $Ce_{0.9}Gd_{0.1}O_{2-\delta}$ (GDC) and dense $Ce_{0.8}Sm_{0.2}O_{2-\delta}$ (SDC) protection interlayer were introduced between Scandia-stabilized zirconia (SSZ) **electrolyte** and $La_{0.6}Sr_{0.4}CoO_{3-\delta}$ (LSC) cathode of low- **temperature** **SOFCs** which operate at 600-800 °C. The reactivity of the interlayer and the **area-specific** **resistance** (ASR) were investigated. EPMA anal. clearly showed that the reaction between LSC cathode and SSZ **electrolyte** did not occur even though GDC interlayer (3-6 . **mu.m**) was porous. Moreover, the reaction between GDC interlayer and SSZ **electrolyte** which were fired at 1320 °C was not observed The ASR of LSC/GDC/SSZ measured by an AC impedance method was reduced 40% or more at each **temperature** compared to LSC cathode on a GDC pellet and showed a low value in 600-800 °C. Thin and relatively dense SDC interlayer (<1 . **mu.m**) was fabricated between LSC cathode and SSZ **electrolyte** by using 2-ethylhexanoic acid **salts** of Sm and Ce, and also in the system using this SDC thin interlayer, low ASR equivalent to LSC/GDC/SSZ was shown, and it became clear that the interlayer in this experiment is very effective in the reduction of ASR.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST ceria interlayer zirconia **electrolyte** LSC cathode low **temp** **SOFC**

IT Electric impedance
Electric resistance
Fuel cell cathodes
Fuel cell electrolytes
(CeO2 interlayer effect on ZrO2 **electrolyte**/La(Sr)CoO3 cathode for low-**temperature** **SOFCs**)

IT **Fuel cells**
(solid oxide; CeO2 interlayer effect on ZrO2 **electrolyte** /La(Sr)CoO3 cathode for low-**temperature** **SOFCs**)

IT 10026-22-9, Nitric acid, cobalt(2+) **salt**, hexahydrate 10042-76-9, Nitric acid, strontium **salt** 10277-43-7, Nitric acid, lanthanum(3+) **salt**, hexahydrate
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(CeO2 interlayer effect on ZrO2 **electrolyte**/La(Sr)CoO3 cathode for low-**temperature** **SOFCs**)

IT 110620-52-5D, Cobalt lanthanum strontium oxide ($CoLa_{0.6}Sr_{0.4}O_3$), oxygen-depleted 162105-72-8D, Cerium samarium oxide ($Ce_{0.8}Sm_{0.2}O_2$), oxygen-depleted 183546-68-1D, Cerium gadolinium oxide ($Ce_{0.9}Gd_{0.1}O_2$), oxygen-depleted 309934-52-9, Cerium scandium zirconium oxide ($Ce_{0.01}Sc_{0.2}Zr_{0.89}O_{2.1}$)
RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(CeO2 interlayer effect on ZrO2 **electrolyte**/La(Sr)CoO3 cathode for low-**temperature** **SOFCs**)

L379 ANSWER 28 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:431502 Document No. 141:126244 **Proton** **Conductive** Polyimide Electrolytes Containing Fluorenyl Groups: Synthesis, Properties, and Branching Effect. Miyatake, Kenji; Zhou, Hua; Watanabe, Masahiro (Clean Energy Research Center,

University of Yamanashi, Kofu, 400-8510, Japan). Macromolecules, 37(13), 4956-4960 (English) 2004. CODEN: MAMOBX. ISSN: 0024-9297. Publisher: American Chemical Society.

AB Novel sulfonated polyimide copolymers as **electrolytes** for high-**temperature** **fuel cell** applications are reported. Sulfonated polyimide copolymers (SPIH-X; X refers to molar **percentage** of fluorenyl content) containing 0-60 mol % of fluorenyl groups as hydrophobic component were synthesized, of which **electrolyte** properties were studied and compared to those of the perfluorinated **ionomer** (Nafion 112). High-mol.-**weight** copolymers with good film-forming capability were obtained. Thermal stability with decomposition **temperature** of ca. 280 °C and no glass transition **temperature** was confirmed for the copolymers. SPIH shows unique water uptake behavior with the maximum value of 57% at X = 30. Water mols. absorbed in the **electrolyte** membrane with this specific composition do not evaporate easily so that the high **proton conductivity** of 1.67 S cm-1 was obtained at 120° and 100% RH. The branching and crosslinking of SPIH-30 were carried out by applying 2 mol % of trifunctional monomer (melamine) in the polymerization and by electron beam irradiation upon the membrane. The branching and crosslinking are effective to improve oxidative stability and mech. strength. Although the **proton conductivity** decreases slightly by the branching and crosslinking, it still remains at the comparable level to that of Nafion 112.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35, 38, 72, 76

ST **proton conductive** polyimide **electrolyte** fluorenyl group branching sulfonated membrane; **fuel cell** separator membrane polyelectrolyte arom polyimide mech strength

IT Polyimides, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(fluorene group- and fluorine-containing, cardo, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, ionomers, electrode binder; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Current density
(from methanol crossover, voltage and humidity effect on; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Electric current-potential relationship
(of assembled **fuel cell**; synthesis, properties, and DMFC performance of **proton conductive** polyimide **electrolytes** containing trifluoromethyl groups)

IT Stability
(oxidative; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Carbon fibers, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(paper, anode **support**; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Fluoropolymers, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic

preparation); PREP (Preparation); USES (Uses)
(polyimide-, fluorene group-containing, cardo, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Cardo polymers
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(polyimides, fluorene group- and fluorine-containing, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers, electrode binder; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Ionomers
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, electrode binder; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Ion exchange membranes
(preparation and ion exchange capacity of; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Ionic **conductivity**
(**proton**; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Crosslinking
(radiochem.; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT **Fuel cell** separators
Fuel cells
Membrane electrodes
Membranes, nonbiological
Polyelectrolytes
(synthesis, properties, and DMFC performance of **proton conductive** polyimide **electrolytes** containing trifluoromethyl groups)

IT Carbon black, uses
RL: DEV (Device component use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT Fluoropolymers, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT 117-61-3P, 4,4'-Diamino-2,2'-biphenyldisulfonic acid
RL: PUR (Purification or recovery); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(DAPS; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT 15499-84-0, 4,4'-(9-Fluorenylidene)dianiline
RL: RCT (Reactant); RACT (Reactant or reagent)
(FDA; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

IT 7732-18-5, Water, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(absorption of; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 7720-78-7, Ferrous sulfate
RL: CAT (Catalyst use); USES (Uses)
(for oxidative stability; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 500783-35-7P
RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
(plain and crosslinked; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 42615-02-1
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 67-56-1, Methanol, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 7440-06-4, Platinum, uses 7440-57-5, Gold, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 108-39-4, m-Cresol, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 481001-37-0P 724457-95-8P
RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 163294-14-2, Nafion 112
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
IT 65-85-0, Benzoic acid, reactions 81-30-1, 1,4,5,8-Naphthalenetetracarboxylic dianhydride 108-78-1, Melamine, reactions 121-44-8, Triethylamine, reactions 7722-84-1, Hydrogen peroxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

L379 ANSWER 29 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:287992 Document No. 140:306758 Electrode-**supported fuel cell.** Rietveld, Gijsbertus; Van Druten, Gerry Martina Regina (Stichting Energieonderzoek Centrum Nederland, Neth.). PCT Int. Appl. WO 2004030133 A1 20040408, 11 pp.

DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English).
CODEN: PIXXD2. APPLICATION: WO 2003-NL663 20030929. PRIORITY: NL 2002-1021547 20020927.

AB Cathode-**supported fuel cell** wherein the cathode **support** comprises a porous part made of an **alloy** containing **iron** and **chromium** and more particularly stainless steel. The anode has a thickness of 1-50 . **mu.m** and preferably consists of **nickel/ nickel** oxide. The cathode preferably consists of LSM material. Such an electrode-**supported fuel cell** can be produced by providing a **metallic support** containing at least **iron** or **chromium** by means of sintering, preferably starting from a powder, successively applying thereto an electrode, **electrolyte** and other electrodes. With this method, a cathode is applied to the **metallic support** and the combination obtained is sintered at a **temperature** between 1000 and 1200°.

IT **7440-47-3, Chromium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(cathode **support**; electrode-**supported fuel cell**)
RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

IT **7440-02-0, Nickel**, uses
RL: DEV (Device component use); USES (Uses)
(electrode-**supported fuel cell**)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-02
ICS H01M008-24
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 55
ST electrode **supported fuel cell**
IT **Alloys**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(cathode **support**; electrode-**supported fuel cell**)
IT **Fuel cell** anodes
Fuel cell cathodes
Fuel cells
Printing (impact)
Sintering
(electrode-**supported fuel cell**)
IT Powders
(sintered, cathode **support**; electrode-**supported fuel cell**)
IT **Coating** process
(spin; electrode-**supported fuel cell**
)

IT 7440-89-6, **Iron**, uses **7440-47-3**,
Chromium, uses 11122-73-9 12597-68-1, Stainless steel, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(cathode **support**; electrode-**supported** **fuel cell**)
IT 1313-99-1, **Nickel** oxide, uses **7440-02-0**,
Nickel, uses 59707-46-9, **Lanthanum** manganese strontium oxide
RL: DEV (Device component use); USES (Uses)
(electrode-**supported fuel cell**)
IT 11133-82-7
RL: TEM (Technical or engineered material use); USES (Uses)
(electrode-**supported fuel cell**)

L379 ANSWER 30 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:275234 Document No. 141:74133 The influence of noble-**metal**-containing cathodes on the electrochemical performance of anode-**supported** SOFCs. Haanappel, V. A. C.; Rutenbeck, D.; Mai, A.; Uhlenbruck, S.; Sebold, D.; Wesemeyer, H.; Rowekamp, B.; Tropartz, C.; Tietz, F. (Institute for Materials and Processes in Energy Systems, Forschungszentrum Julich, Julich, 52425, Germany). Journal of Power Sources, 130(1-2), 119-128 (English) 2004. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..
AB To enhance the catalytic activity of the cathode for oxygen reduction and thus to increase the electrochem. performance of planar anode-**supported** solid oxide **fuel cells**, Pd, Ag, or Pt was added to the cathode. Four routes were used to add these noble **metals**: infiltration of the cathode with a Pd solution, deposition of Pt on the **electrolyte surface**, mixing of La0.65Sr0.30MnO3 (LSM) and YSZ cathode powders with different **metal** precursors (Pt and Pd black, Pd on activated carbon, Ag powder, Ag2O, Ag acetate, Ag citrate, Ag2CO3, colloidal Ag, AgNO3), and synthesis of LSM powder with the addition of AgNO3. Between 750 and 900° no electrocatalytic effect occurred with respect to the presence of Pt, either added by deposition on the **electrolyte** or by mixing with cathode powders. Infiltration of the cathode with a Pd solution or mixing with Pd black did not result in a pos. effect either. A catalytic effect was only found with Pd on activated carbon and in particular at lower **temps.** Cells prepared with Ag powder and Ag2O showed an improved electrochem. performance compared to Ag-free cells sintered at the same **temperature** (920°). However, in comparison to Ag-free cells sintered at the standard **temperature** (1100°) lower current densities were measured. This can be explained by a weak contact between **electrolyte** and cathode functional **layer** and an insufficiently sintered cathode. A detrimental effect was observed regarding the addition of the other Ag precursors. Thermal decomposition of these precursors gave large pores in the cathode.
IT **7440-05-3**, Palladium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 72, 76
ST noble **metal** cathode anode **supported** solid oxide fuel cell; YSZ LSM cathode **metal** precursor deposition

current density potential
IT Electric **resistance**
(**area-specific**; comparison of current-voltage relationships for fuel cells with different cathode **metal** catalysts, silver precursors and content level, bias voltages, and **temps.**)
IT Noble **metals**
RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(comparison of current-voltage relationships for fuel cells with different cathode **metal** catalysts, silver precursors and content level, bias voltages, and **temps.**)
IT Coprecipitation
Fuel cell cathodes
Impregnation
Vapor deposition process
(influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT Current density
Electric current-potential relationship
(of assembled fuel cells; comparison of current-voltage relationships for fuel cells with different cathode **metal** catalysts, silver precursors and content level, bias voltages, and **temps.**)
IT Fuel cells
(solid oxide; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 157975-55-8P, Lanthanum manganese strontium oxide (La0.65MnSr0.3O3)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(LSM, cathode, and **layer** with 8YSZ; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(activated, with Pd, in cathode composite fabrication; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 7440-02-0P, Nickel, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(anode cermet with 8YSZ and mesh; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 403694-09-7, 8YSZ
RL: DEV (Device component use); USES (Uses)
(anode cermet with Ni, and **electrolyte layer**, cathode functional **layer** with LSM; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported SOFCs**)
IT **7440-05-3**, Palladium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 7440-22-4P, Silver, uses
RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 1333-74-0, Hydrogen, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)
IT 7440-06-4, Platinum, uses

RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(powder and mesh on cathode **side**; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)

IT 534-16-7 563-63-3, Silver acetate 7761-88-8, Silver nitrate, reactions 20667-12-3, Silver oxide (Ag2O) 36701-38-9, Silver citrate
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(precursor; influence of noble-**metal**-containing cathodes on electrochem. performance of anode-**supported** SOFCs)

L379 ANSWER 31 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:204125 Document No. 140:202496 Fuel cell electrode. Scott, Keith; Cheng, Hua (Newcastle University Ventures Limited, UK). PCT Int. Appl. WO 2004021486 A2 20040311, 61 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-GB3715 20030827. PRIORITY: GB 2002-19955 20020828.

AB The invention concerns a **fuel cell** having an electrode comprising an electrocatalyst on a **support**, wherein the **support** is a mesh of conductive material, as well as a method of operating such a **fuel cell** by contacting a fuel and an oxidant on the electrode. The **electrolyte** is an **ion** exchange membrane. The electrocatalyst is a **metal**, **metal** alloy, **metal** oxide, or **metal hydride.**

IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; fuel cell electrode)

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**; **fuel cell** electrode)

IT Fuel cell anodes
Fuel cell cathodes
Ion exchange membranes
(**fuel cell** electrode)

IT Alloys, uses
Hydrides
Metals, uses
Oxides (inorganic), uses
RL: CAT (Catalyst use); USES (Uses)
(fuel cell electrode)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**; **fuel cell** electrode)

IT **Ionomers**
RL: DEV (Device component use); USES (Uses)

(polyoxyalkylenes, fluorine- and sulfo-containing; **fuel cell** electrode)
IT **Fuel cells**
(solid **electrolyte**; **fuel cell** electrode)
IT **Titanium** alloy, base
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; fuel cell electrode)
IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; fuel cell electrode)

L379 ANSWER 32 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:41397 Document No. 140:61782 **Metal** oxides prepared by flame spray pyrolysis. Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). PCT Int. Appl. WO 2004005184 A1 20040115, 45 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-IB2172 20030520. PRIORITY: EP 2002-14100 20020703; US 2002-2002/PV394965 20020709.
AB **Metal** oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis. The **metal** oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a **temperature** of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at at least about 23.7 kJ/g. The **metal** oxide precursors are organic **salts**, especially cerium acetate hydrate and zirconium acetylacetonate. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O2/kg catalyst and is therefor suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al2O3. The catalyst can contain addnl. catalytically active substances, such as further **metal** oxides, e.g. titania, vanadia, chromia, manganese, **iron**, cobalt, **nickel**, **copper** oxides, and/or noble **metals**, e.g. platinum, **palladium**, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielecs., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in **metal** alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, **fuel cells**, and/or superconductors.
IT **7440-05-3, Palladium**, uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10;
B01J035-10; B01J023-63; C09K003-14; B01J023-42
CC 49-3 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57, 59, 67
IT Polishing
(chemical-mech.; **metal** oxides prepared by flame spray
pyrolysis)
IT Exhaust gas catalytic converters
(**metal** oxides prepared by flame spray pyrolysis)
IT Calcination
(spray; **metal** oxides prepared by flame spray pyrolysis)
IT Catalysts
(three-way; **metal** oxides prepared by flame spray
pyrolysis)
IT 1344-28-1, Aluminum oxide (Al2O3), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(catalyst **support**; **metal** oxides prepared by
flame spray pyrolysis)
IT 1308-38-9, **Chromium** oxide (Cr2O3), uses 1313-99-1,
Nickel oxide (NiO), uses 1314-62-1, **Vanadium**
oxide (V2O5), uses 1332-37-2, **Iron** oxide, uses
1344-70-3, **Copper** oxide 7439-88-5, Iridium, uses
7439-96-5, Manganese, uses **7440-05-3**, **Palladium**,
uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses
7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3,
Cobalt oxide 13463-67-7, **Titanium** oxide (TiO2), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)
IT 17501-44-9 133648-99-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(**metal** oxides prepared by flame spray pyrolysis)
IT 64-19-7, Acetic acid, uses 143-07-7, Dodecanoic acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; **metal** oxides prepared by flame spray pyrolysis)
IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(storage; **metal** oxides prepared by flame spray pyrolysis)
IT 1314-23-4, Zirconium oxide (ZrO2), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(yttria or ceria-stabilized; **metal** oxides prepared by
flame spray pyrolysis)
IT 1306-38-3, Cerium oxide (CeO2), uses 1314-36-9, Yttrium oxide
(Y2O3), uses
RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
(zirconia stabilized with; **metal** oxides prepared by flame
spray pyrolysis)

L379 ANSWER 33 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:39663 Document No. 140:62378 Molten **hydride** fuel cell.
Roy, Prodyot; Salamah, Samir Armando; Rodgers, Douglas Noss (General
Electric Company-Global Research Center, USA). U.S. Pat. Appl.
Publ. US 2004009390 A1 20040115, 8 pp. (English). CODEN: USXXCO.
APPLICATION: US 2002-64408 20020710.
AB A **fuel cell** assembly comprises at least one
fuel cell. The **fuel cell**
comprises an anode and a cathode held in a spaced apart relationship
by at least one spacer element comprising an elec. insulating
material. A proximal end of the spacer element is in contact with
the cathode, and a distal end is in contact with the anode. An
electrolyte is disposed between, and in contact with the
anode and the cathode. The **electrolyte** comprises a molten

salt having a **hydride ion** conductance
number greater than about 0.95 at a **fuel cell**
operating **temperature** A fuel gas inlet, adjacent to the
cathode, is provided for delivering a fuel gas to the
electrolyte. An oxidizing gas inlet, adjacent to the anode,
is provided for delivering an oxidizing gas to the
electrolyte. An exhaust port is in fluid communication with
the anode.

IT **7440-05-3, Palladium**, uses **7440-62-2, Vanadium**, uses **12735-99-8**
RL: TEM (Technical or engineered material use); USES (Uses)
(membrane; molten **hydride** fuel cell)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12735-99-8 HCAPLUS
CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component Registry Number
Ag	7440-22-4
Pd	7440-05-3

IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(β-, membrane; molten **hydride** fuel cell)

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-14
ICS H01M004-94
INCL 429046000; 429040000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell molten **hydride**
IT Membranes, nonbiological
(hydrogen-permeable; molten **hydride** fuel cell)
IT Fuel cell anodes
Fuel cell cathodes
Fuel cells
Refractories
(molten **hydride** fuel cell)
IT **Hydrides**
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(molten **hydride** fuel cell)
IT Alkali **metal** halides, uses
Alkali **metal hydrides**
Salts, uses
RL: DEV (Device component use); USES (Uses)
(molten; molten **hydride fuel cell**)

IT Silicate glasses
RL: TEM (Technical or engineered material use); USES (Uses)
(spacer; molten **hydride** fuel cell)
IT **7440-05-3, Palladium**, uses **7440-62-2, Vanadium**, uses **12735-99-8**
RL: TEM (Technical or engineered material use); USES (Uses)
(membrane; molten **hydride** fuel cell)
IT 7782-44-7, Oxygen, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(molten **hydride** fuel cell)
IT 74-82-8, Methane, uses 74-98-6, Propane, uses 1333-74-0, Hydrogen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(molten **hydride** fuel cell)
IT 7447-40-7, Potassium chloride (KCl), uses 7447-41-8, Lithium chloride (LiCl), uses 7550-35-8, Lithium bromide (LiBr) 7580-67-8, Lithium **hydride** (LiH) 7646-69-7, Sodium **hydride** (NaH) 7647-14-5, Sodium chloride, uses 7647-15-6, Sodium bromide (NaBr), uses 7681-49-4, Sodium fluoride, uses 7693-26-7, Potassium **hydride** 7758-02-3, Potassium bromide (KBr), uses 7789-23-3, Potassium fluoride (KF) 7789-24-4, Lithium fluoride, uses
RL: DEV (Device component use); USES (Uses)
(molten; molten **hydride** fuel cell)
IT 7439-98-7, Molybdenum, uses 7440-15-5, Rhenium, uses 7440-33-7, Tungsten, uses
RL: DEV (Device component use); USES (Uses)
(refractory; molten **hydride** fuel cell)
IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 10043-11-5, Boron nitride, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(spacer; molten **hydride** fuel cell)
IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(β-, membrane; molten **hydride** fuel cell)

L379 ANSWER 34 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:17779 Document No. 140:62322 **Ionic conductors** containing amorphous silica gel for **fuel cell electrolytes** and secondary lithium battery **electrolytes.** Mori, Hiroshi; Tezuka, Makoto (Mitsubishi Chemical Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2004002114 A2 20040108, 20 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-160636 20020531.
AB The silica gel has pore volume 0.3-3.0 mL/g, sp. **surface** area 200-1000 m2/g, a pore size distribution having a peak at 20 nm, and solid Si-NMR spectrum having prescribed chemical shift (δ ppm) of Q4 peak (definition given). The ionic **conductors** contain ionic conductive compds. or compns. (either **proton conductive** or Li ion conductive) in addition to the silica gel **supports.** Thus, tetramethoxysilane was hydrolyzed, gelated, and hydrothermally treated to give the silica gel which was then soaked in an aqueous H3PO4 solution to carry H3PO4 (**proton conductor**). The obtained **proton conductor** showed excellent performance at a wide **temperature** region.
IC ICM C01B033-152
ICS H01B001-06; H01M008-02; H01M010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
ST **ionic conductor support** amorphous silica gel; **proton conductor support** amorphous silica gel; **fuel cell electrolyte** amorphous silica gel; lithium battery **electrolyte** amorphous silica gel
IT Silica gel, uses

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(amorphous; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery **electrolytes**)

IT **Fuel cell electrolytes**
Ionic conductors
Solid **electrolytes**
(**ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery **electrolytes**)

IT Battery **electrolytes**
(lithium; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery **electrolytes**)

IT 681-84-5, Tetramethoxysilane
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(hydrolysis, gelation, and hydrothermal treatment of; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery **electrolytes**)

IT 7664-38-2, Phosphoric acid, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**proton conductor**; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery **electrolytes**)

L379 ANSWER 35 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:17411 Document No. 140:44264 **Metal** oxides prepared by flame spray pyrolysis. Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). Eur. Pat. Appl. EP 1378489 A1 20040107, 24 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2002-14100 20020703.

AB **Metal** oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis. The **metal** oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a **temperature** of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at at least about 23.7 kJ/g. The **metal** oxide precursors are organic **salts**, especially cerium acetate hydrate and zirconium acetylacetonate. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O_2/kg catalyst and is therefor suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al_2O_3. The catalyst can contain addnl. catalytically active substances, such as further **metal** oxides, e.g. titania, vanadia, chromia, manganese, **iron**, cobalt, **nickel**, **copper** oxides, and/or noble **metals**, e.g. platinum, **palladium**, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for

chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielecs., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in **metal** alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, **fuel cells**, and/or superconductors.

IT **7440-05-3**, **Palladium**, uses
RL: CAT (Catalyst use); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10; B01J035-10; B01J023-63; C09K003-14

CC 49-3 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57, 59, 67

IT Polishing
(chemical-mech.; **metal** oxides prepared by flame spray pyrolysis)

IT Exhaust gas catalytic converters
(**metal** oxides prepared by flame spray pyrolysis)

IT Calcination
(spray, flame; **metal** oxides prepared by flame spray pyrolysis)

IT Catalysts
(three-way; **metal** oxides prepared by flame spray pyrolysis)

IT 1344-28-1, Alumina, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**; **metal** oxides prepared by flame spray pyrolysis)

IT 1308-38-9, Chromia, uses 1313-99-1, **Nickel** oxide, uses 1314-62-1, Vanadia, uses 1332-37-2, **Iron** oxide, uses 1344-70-3, **Copper** oxide 7439-88-5, Iridium, uses 7439-96-5, Manganese, uses **7440-05-3**, **Palladium**, uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3, Cobalt oxide 13463-67-7, Titania, uses
RL: CAT (Catalyst use); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)

IT 17501-44-9, Zirconium acetylacetonate 133648-99-4, Acetic acid, cerium(3+) salt, monohydrate
RL: RCT (Reactant); RACT (Reactant or reagent)
(**metal** oxides prepared by flame spray pyrolysis)

IT 64-19-7, Acetic acid, uses 143-07-7, Lauric acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; **metal** oxides prepared by flame spray pyrolysis)

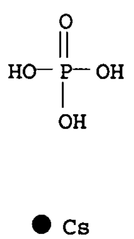
IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(storage; **metal** oxides prepared by flame spray pyrolysis)

IT 1314-23-4P, Zirconia, preparation
RL: CAT (Catalyst use); NUU (Other use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(yttria or ceria-stabilized; **metal** oxides prepared by flame spray pyrolysis)

IT 1306-38-3P, Ceria, preparation 1314-36-9P, Yttria, preparation
RL: CAT (Catalyst use); MOA (Modifier or additive use); NUU (Other

use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(zirconia stabilized with; **metal** oxides prepared by flame spray pyrolysis)

L379 ANSWER 36 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:1012123 Document No. 140:96838 High-Performance Solid Acid Fuel Cells Through Humidity Stabilization. Boysen, Dane A.; Uda, Tetsuya; Chisholm, Calum R. I.; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Science (Washington, DC, United States), 303(5654), 68-70 (English) 2004. CODEN: SCIEAS. ISSN: 0036-8075. Publisher: American Association for the Advancement of Science.
AB State-of-the-art **fuel cells** based on polymer **electrolyte** membranes are inoperable >100°, they require cumbersome humidification systems, and suffer from fuel permeation. These difficulties all arise from the hydrated nature of the **electrolyte.** Solid acids however exhibit anhydrous p transport and high-**temperature** stability. Continuous, stable power generation for both H2/O2 and direct MeOH **fuel cells** operated at .apprx.250° was demonstrated using a humidity-stabilized solid acid **CsH2PO4 electrolyte.**
IT **18649-05-3**, Cesium phosphate (**CsH2PO4**)
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; in humidity stabilization of high-performance **fuel cell** with solid acid **electrolyte**)
RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST cesium phosphate solid acid **electrolyte** humidity stabilization **fuel cell**
IT **Fuel cell electrolytes**
Fuel cell separators
Humidity
(humidity stabilization of high-performance **fuel cell** with solid acid **electrolyte**)
IT **18649-05-3**, Cesium phosphate (**CsH2PO4**)
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; in humidity stabilization of high-performance **fuel cell** with solid acid **electrolyte**)
IT 1333-74-0, Hydrogen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(humidity stabilization of solid acid **electrolyte** for high-performance **fuel cell** using)
IT 67-56-1, Methanol, uses 7782-44-7, Oxygen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(humidity stabilization of solid acid **electrolyte** for high-performance **fuel cell** using)

L379 ANSWER 37 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:989964 Document No. 140:29512 Solid oxide **fuel**
cell with enhanced mechanical and electrical properties.
Carter, John David; Bae, Joong-Myeon; Cruse, Terry Alan; Ralph,
James Michael; Kumar, Romesh; Krumpelt, Michael (USA). U.S. Pat.
Appl. Publ. US 2003232230 A1 20031218, 10 pp. (English). CODEN:
USXXCO. APPLICATION: US 2002-167917 20020612.

AB A solid oxide **fuel cell** (**SOFC**) repeat
unit includes an oxide **electrolyte**, an anode, a
metallic fuel flow field, a **metallic** interconnect,
and a **metallic** air flow field. The multilayer laminate is
made by casting tapes of the different functional **layers**,
laminating the tapes together and sintering the laminate in a
reducing atmospheric **SOFC** stacks are made by applying a cathode
layer, bonding the unit into a gas manifold plate, and then
stacking the cells together. This process leads to superior mech.
properties in the **SOFC** due to the toughness of the
supporting metallic layers. It also
reduces contact resistances in stacking the cells since there is
only one phys. contact plane for each repeat unit.

IT **7440-02-0, Nickel**, uses
RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** with enhanced mech.
and elec. properties)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-12
ICS H01M008-24

INCL 429032000; 429038000; 264618000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** solid oxide

IT **Fuel cell** anodes
(ceramic-**metal**; solid oxide **fuel cell**
with enhanced mech. and elec. properties)

IT Catalysts
(electrocatalysts; solid oxide **fuel cell** with
enhanced mech. and elec. properties)

IT **Fuel cell electrolytes**
Interconnections, electric
(solid oxide **fuel cell** with enhanced mech.
and elec. properties)

IT **Fuel cells**
(solid oxide; solid oxide **fuel cell** with
enhanced mech. and elec. properties)

IT Molding
(tape-casting; solid oxide **fuel cell** with
enhanced mech. and elec. properties)

IT **Nickel alloy**, base
RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** with enhanced mech.
and elec. properties)

IT 1314-36-9, Yttria, uses
RL: MOA (Modifier or additive use); USES (Uses)
(ZrO_2 stabilized with; solid oxide **fuel cell**
with enhanced mech. and elec. properties)

IT 11129-18-3, Cerium oxide 55030-80-3, Gallium **lanthanum**
oxide
RL: DEV (Device component use); USES (Uses)
(doped; solid oxide **fuel cell** with enhanced
mech. and elec. properties)

IT **7440-02-0, Nickel**, uses 64417-98-7, Yttrium
zirconium oxide

RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** with enhanced mech.
and elec. properties)
IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); USES (Uses)
(yttria-stabilized; solid oxide **fuel cell**
with enhanced mech. and elec. properties)

L379 ANSWER 38 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:969455 Document No. 140:29505 Thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells.** Taniguchi, Noboru (Matsushita Electric Industrial Co., Ltd., Japan). Eur. Pat. Appl. EP 1369949 A2 20031210, 28 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2003-12535 20030602. PRIORITY: JP 2002-165456 20020606.

AB A thin-film (≤300 μm thickness) **proton-conducting** solid **electrolyte** for a solid-oxide **fuel cell** has the general composition Ba(Zr1-xCex)1-yMyAlzO3 -α, in which M is one or more trivalent rare earth **cations** and In3+; y = 0-0.3; x = 0-1; z = 0-0.4; and α = 0-1.5. The **fuel cell** electrode is typically carbon-**supported** Pt. A solid-**electrolyte fuel cell** can obtain a cell output even at low **temperature** (i.e., ≤500°).

IT **288866-05-7P**, Barium cerium neodymium zirconium oxide (BaCe0.4Nd0.2Zr0.4O3) **386720-65-6P**, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) **632286-96-5P**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3) **632286-97-6P**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3) **632287-08-2P**, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.4Zr0.4O3)
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(oxygen-deficient, **proton conductors**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

RN 288866-05-7 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.4Nd0.2Zr0.4O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.4	7440-45-1
Ba	1	7440-39-3
Nd	0.2	7440-00-8

RN 386720-65-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba	1	7440-39-3

RN 632286-96-5 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632287-08-2 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.4Zr0.4O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.4	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST solid oxide **proton conducting fuel cell electrolyte**; barium transition **metal** rare earth oxide solid **electrolyte**; aluminum barium zirconium oxide solid **electrolyte fuel cell**
IT Rare earth oxides
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(aluminum barium zirconium transition **metal** oxides, **electrolytes**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)
IT Transition **metal** oxides
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(barium rare earth oxides, **electrolyte**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)
IT Rare earth oxides

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(barium transition **metal** oxides, **electrolyte**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

IT **Ionic conductivity**
Ionic conductors
(**proton**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

IT **Fuel cells**
(solid **electrolyte**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

IT **Fuel cell electrolytes**
(solid-oxide; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); USES (Uses)
(electrode; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

IT 134775-34-1P, Barium cerium praseodymium oxide (BaCe0.8Pr0.2O3) 144378-46-1P, Barium cerium gadolinium oxide (BaCe0.8Gd0.2O3) 148791-56-4P, Barium cerium dysprosium oxide (BaCe0.8Dy0.2O3) 148972-97-8P, Barium cerium samarium oxide (BaCe0.8Sm0.2O3) 162759-81-1P, Barium cerium erbium oxide (BaCe0.8Er0.2O3) 170023-54-8P, Barium cerium terbium oxide (BaCe0.8Tb0.2O3) 237055-46-8P, Barium cerium lanthanum oxide (BaCe0.8La0.2O3) 288865-89-4P, Barium cerium yttrium zirconium oxide (BaCe0.4Y0.2Zr0.4O3) **288866-05-7P**, Barium cerium neodymium zirconium oxide (BaCe0.4Nd0.2Zr0.4O3) 288866-24-0P, Barium cerium indium zirconium oxide (BaCe0.4In0.2Zr0.4O3) 288866-28-4P, Barium cerium indium zirconium oxide (BaCe0.5In0.2Zr0.3O3) **386720-65-6P**, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) 632286-92-1P, Barium cerium ytterbium zirconium oxide (BaCe0.4Yb0.2Zr0.4O3) 632286-93-2P, Aluminum barium cerium gadolinium oxide (Al0.02BaCe0.8Gd0.2O3) 632286-94-3P 632286-95-4P **632286-96-5P**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3) **632286-97-6P**, Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3) 632286-98-7P 632286-99-8P 632287-00-4P, Aluminum barium cerium europium oxide (Al0.02BaCe0.8Eu0.2O3) 632287-01-5P, Barium cerium promethium oxide (BaCe0.8Pm0.2O3) 632287-02-6P, Barium cerium holmium oxide (BaCe0.8Ho0.2O3) 632287-03-7P, Barium cerium thulium oxide (BaCe0.8Tm0.2O3) 632287-04-8P, Barium cerium lutetium oxide (BaCe0.8Lu0.2O3) 632287-05-9P, Barium cerium scandium oxide (BaCe0.8Sc0.2O3) 632287-06-0P 632287-07-1P **632287-08-2P**, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.4Zr0.4O3) 632287-09-3P, Barium cerium indium zirconium oxide (BaCe0.1In0.3Zr0.6O3) 632287-10-6P
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(oxygen-deficient, **proton conductors**; thin-film barium-transition **metal** oxide-rare earth oxide **proton-conducting** solid **electrolytes** for **fuel cells**)

L379 ANSWER 39 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:928082 Document No. 140:62132 Current status of **metallic** substrate **supported** thin-**film** SOFC at DLR

stuttgart. Schiller, Guenter; Franco, Thomas; Henne, Rudolf; Lang, Michael; Ruckdaeschel, Robert; Otschik, Peter; Eichler, Klaus (Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Stuttgart, D-70569, Germany). Proceedings - Electrochemical Society, 2001-16(Solid Oxide Fuel Cells VII), 885-894 (English) 2001. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB A review (12 refs.). The planar **metallic** substrate **supported** thin-**film** **SOFC** concept developed at DLR Stuttgart on the basis of advanced plasma spray technol. ("spray concept") enables the fabrication of complete cells with a size of up to 20 + 20 cm2. The electrode **layers** and the thin **electrolyte** with a total thickness of the MEA structure of less than 100-120 μ**m** are consecutively deposited onto a porous **metallic** substrate in a single time- and cost-effective spray procedure. The thin-**film** cells show high electrochem. performance at reduced operating **temperature** in the **temperature** range 750-800 °C. The present paper describes the current status of the DLR spray concept including fabrication technol. and scale-up aspects, recent developments with materials and components and electrochem. performance of plasma sprayed thin-**film** **SOFC.**

CC 52-0 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 55, 56, 72, 76

ST review SOFC **metal support** DLR stuttgart

IT **Coating** process
(plasma spraying; status of **metallic** substrate **supported** thin-**film** SOFC at DLR stuttgart)

IT Alloys, uses
Metals, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(porous, substrates; status of **metallic** substrate **supported** thin-**film** SOFC at DLR stuttgart)

IT Fuel cells
(solid oxide; status of **metallic** substrate **supported** thin-**film** SOFC at DLR stuttgart)

IT Porous materials
(substrates; status of **metallic** substrate **supported** thin-**film** SOFC at DLR stuttgart)

L379 ANSWER 40 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:892312 Document No. 139:352742 Method for fabrication of solid polymer **fuel cell.** Hiroi, Osamu; Fukumoto, Hisatoshi; Yoshida, Yasuhiro; Kurata, Tetsuyuki (Mitsubishi Denki Kabushiki Kaisha, Japan). U.S. Pat. Appl. Publ. US 2003211380 A1 20031113, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2003-429944 20030506. PRIORITY: JP 2002-135831 20020510; JP 2003-104282 20030408.

AB The invention concerns a solid polymer type **fuel cell** having a polyelectrolyte **film** having a **proton conductivity**; an anode and a cathode arranged on the opposite **sides** of the polyelectrolyte **film**; and a gas flow channel for supplying gas to the both electrodes, the anode and the cathode each being composed of a catalyst **layer** that is in contact with the polyelectrolyte **film** and a gas diffusion **layer** for allowing the diffusion of gas supplied from the gas flow channel to the catalyst **layer**, in which the gas diffusion **layer** included in the cathode electrode is constructed of a carbon-containing material and the **surface** of the carbon-containing material is modified to be hydrophilic.

IC ICM H01M004-96
ICS H01M008-10; H01M004-94

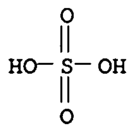
INCL 429044000; 429030000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38
ST polymer solid type **fuel cell** fabrication
IT Carbon black, uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
(catalytic **metal supported**; method for fabrication of solid polymer **fuel cell**)
IT Dew point
(cathode gas; method for fabrication of solid polymer **fuel cell**)
IT Oxides (inorganic), uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrophilic **coating**; method for fabrication of solid polymer **fuel cell**)
IT **Coating** materials
(method for fabrication of solid polymer **fuel cell**)
IT Carbon fibers, uses
RL: DEV (Device component use); USES (Uses)
(method for fabrication of solid polymer **fuel cell**)
IT Polyesters, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(method for fabrication of solid polymer **fuel cell**)
IT **Fuel cells**
(solid **electrolyte**; method for fabrication of solid polymer **fuel cell**)
IT 7631-86-9, Silica, uses 13463-67-7, **Titanium** oxide, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**coating**; method for fabrication of solid polymer **fuel cell**)
IT 7440-06-4, Platinum, uses 12779-05-4
RL: CAT (Catalyst use); USES (Uses)
(method for fabrication of solid polymer **fuel cell**)
IT 25038-59-9, Polyethylene terephthalate, uses 322012-68-0, TGP-H 090
RL: TEM (Technical or engineered material use); USES (Uses)
(method for fabrication of solid polymer **fuel cell**)

L379 ANSWER 41 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:872494 Document No. 139:367512 **Fuel cell** with solid **electrolytic** membrane and catalyst electrode for improved cell characteristic and reliability. Imai, Hideto; Yoshitake, Tsutomu; Shimakawa, Yuichi; Shinko, Takashi; Nakamura, Arata; Kimura, Hidekazu; Kuroshima, Sadanori; Kubo, Yoshimi (NEC Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2003317736 A2 20031107, 12 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-117954 20020419.
AB **Fuel cell** has **fuel** electrode, to which liquid fuel is supplied, oxidizer electrode and a solid **electrolyte** membrane sandwiched between the fuel electrode and the oxidizer electrode, wherein a layer containing H2-containing oxoacid **salt** is formed between the fuel electrode or oxidizer electrode and the solid **electrolyte** membrane, optionally the solid **electrolyte** membrane contains the H2-containing oxoacid **salt**. The catalyst electrode comprises a substrate, a catalyst layer formed on the substrate, and a layer containing H2-containing oxoacid layer. In the **fuel cell**, the **proton conductivity** is satisfactorily maintained and the penetration and crossover of liquid fuel are suppressed to improve cell characteristics and reliability.
IT **7789-16-4**, Cesium bisulfate
RL: TEM (Technical or engineered material use); USES (Uses)

(**fuel cell** with solid **electrolytic**
membrane and catalyst electrode containing H2-containing oxoacid
salt for improved cell characteristic and reliability)
RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

IT **7440-05-3**, Palladium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; **fuel**
cell with solid **electrolytic** membrane and
catalyst electrode containing H2-containing oxoacid **salt** for
improved cell characteristic and reliability)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-02
ICS C01B019-00; H01M004-86; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** hydrogen contg oxyacid **salt**
IT **Fuel cell** electrodes
(catalytic; **fuel cell** with solid
electrolytic membrane and catalyst electrode containing
H2-containing oxoacid **salt** for improved cell characteristic
and reliability)
IT **Fuel cells**
Solid **electrolytes**
(**fuel cell** with solid **electrolytic**
membrane and catalyst electrode containing H2-containing oxoacid
salt for improved cell characteristic and reliability)
IT Zeolites (synthetic), uses
RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; **fuel**
cell with solid **electrolytic** membrane and
catalyst electrode containing H2-containing oxoacid **salt** for
improved cell characteristic and reliability)
IT **Fuels**
(liquid; **fuel cell** with solid
electrolytic membrane and catalyst electrode containing
H2-containing oxoacid **salt** for improved cell characteristic
and reliability)
IT **7789-16-4**, Cesium bisulfate 120635-35-0 133883-65-5
620970-69-6 620970-70-9 620970-73-2
RL: TEM (Technical or engineered material use); USES (Uses)
(**fuel cell** with solid **electrolytic**
membrane and catalyst electrode containing H2-containing oxoacid
salt for improved cell characteristic and reliability)
IT **7440-05-3**, Palladium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; **fuel**
cell with solid **electrolytic** membrane and

catalyst electrode containing H2-containing oxoacid **salt** for
improved cell characteristic and reliability)

L379 ANSWER 42 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:872490 Document No. 139:367511 Manufacture of gas-diffusion electrode for manufacture of solid polymer fuel cell. Tanuma, Toshihiro; Kinoshita, Shinji (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003317727 A2 20031107, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-124436 20020425.

AB The electrode which is placed next to an ion-exchange membrane and contains carbon-**supported metal** catalysts and F-containing ion-exchange resins, is manufactured by (1) mixing the catalysts with the ion-exchange resins in liquid to satisfy WF/WC ratio ≥0.01 and <0.05 (WF = weight of the resins; WC = weight of C in the catalysts) to give a dispersion A having dispersed ≤1.0 . **mu.m**-catalyst particle ratio to total catalyst particles ≥20 volume%, (2) adding the resins to the dispersion A to give a dispersion B satisfying WF/WC ratio 0.5-1.7, and (3) **coating** with the dispersion B. The electrode formed on the ion-exchange membrane **surface** is porous, conductive, water-repellent, and durable and gives the cell with high power and durability.

IC ICM H01M004-88
ICS H01M004-86; H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST solid polymer **fuel cell** gas diffusion electrode; **metal** carbon catalyst **fuel cell** electrode; **ion** exchange fluoropolymer **fuel cell** electrode

IT **Ion** exchangers
(F-containing; manufacture of gas-diffusion electrode containing **metal** -carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT **Fuel cell** electrodes
(gas diffusion; manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT Catalysts
(manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT Carbon black, uses
RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT Fluoropolymers, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT 158191-37-8, Flemion S
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**ion**-exchange membrane, electrode formed on; manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses
RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical,

engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

IT 31175-20-9
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of gas-diffusion electrode containing **metal**-carbon catalysts and F-contg **ion**-exchange resins for solid polymer **fuel cell**)

L379 ANSWER 43 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:830687 Document No. 140:148997 On the use of Pd filters on **proton conducting SOFC** ceramics.
Schober, T. (IFF, Forschungszentrum Juelich, Juelich, 52425, Germany). Ionics, 9(3 & 4), 297-300 (English) 2003. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.

AB Ceramic **proton conductors** are materials which **conduct protons** under an applied elec. field and permit the construction of a **SOFC** in analogy to the oxygen **ion conductor** 8YSZ. Such protonic ceramic **fuel cells** have been labeled PCFCs to distinguish them from the standard **SOFCs.** PCFCs have several advantages when compared with standard **SOFCs.** First, there is no water contamination of the fuel gas. Second, the **protonic conductivity** may be higher in the intermediate **temperature** range (550-700°C). Also, the activation energy for proton migration is much lower than that of oxygen **ion** conduction. In addition, internal reforming is also possible permitting the use of natural gas. An intriguing possibility is the use of palladium filters on the fuel **side** which only permit the diffusion of protons to the filter-**electrolyte** interface. This may reduce undesirable mixing of the fuel and the oxygen on either **side** of the **electrolyte.** In this work, it is shown that the entry of protons from the Pd into the ceramic **conductor** is straight forward. Prototype test PCFCs are shown to operate as required. To test the Pd-ceramic **proton conductor** system a study was undertaken using Pd tubes which were coated with thin layers of the **proton conducting** ceramics. When flushing the tube insides with H2 and exposing the outsides to air, Nernst voltages of such electrochem. cells could be recorded as a function of **temperature** The present rather preliminary work, however, was hampered by leakage of the thin film HTPC (high **temperature proton conductor**). Thus, the theor. Nernst voltages were not attained.

IT **191980-68-4**, Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O8.73)
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(BCN18; Pd filters in **proton conducting SOFC** ceramics)

RN 191980-68-4 HCAPLUS
CN Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O8.73) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

IT **7440-05-3**, Palladium, uses **37197-23-2**
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(Pd filters in **proton conducting SOFC** ceramics)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 37197-23-2 HCAPLUS
CN Silver alloy, base, Ag 70,Pd 30 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Ag	70	7440-22-4
Pd	30	7440-05-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76
ST **proton conducting** solid oxide **fuel cell**; palladium filter **proton conducting SOFC**
IT Electric **conductors**, ceramic
Electric potential
Perovskite-type crystals
(Pd filters in **proton conducting SOFC** ceramics)
IT **Ionic conductivity**
(**proton**; Pd filters in **proton conducting SOFC** ceramics)
IT **Fuel cells**
(solid oxide; Pd filters in **proton conducting SOFC** ceramics)
IT **191980-68-4**, Barium calcium niobium oxide ($Ba_3Ca_{1.18}Nb_{1.82}O_{8.73}$)
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(BCN18; Pd filters in **proton conducting SOFC** ceramics)
IT 1333-74-0, Hydrogen, uses
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(Pd filters in **proton conducting SOFC** ceramics)
IT **7440-05-3**, Palladium, uses 7440-06-4, Platinum, uses **37197-23-2** 142107-79-7D, Calcium indium zirconium oxide ($CaIn_{0.1}Zr_{0.9}O_3$), oxygen-depleted 403694-09-7, 8YSZ 653573-09-2D, Barium cerium yttrium zirconium oxide ($BaCe_{0.05}Y_{0.15}Zr_{0.8}O_3$), oxygen-depleted
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(Pd filters in **proton conducting SOFC** ceramics)

L379 ANSWER 44 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:763604 Document No. 140:79659 Differential resistance analysis of protonic ceramic fuel cells for measuring bulk conductivity. Coors, W. Grover; Zhong, Dalong (Protonetics International Inc., Golden, CO, USA). Solid State Ionics, 162-163, 283-290 (English) 2003. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
AB A technique, called differential resistance anal., was developed to

determine the bulk conductivity of protonic ceramic **electrolyte** in hydrogen/air **fuel cells** under load. For these expts., identical specimens of the protonic ceramic $BaCe0.9Y0.1O3-\alpha$ (BCY10) were prepared with thicknesses of 240, 560, 790, and 1150 **.mu.m** with thin **film** platinum electrodes. The current-voltage (I-V) characteristic curves for each specimen were obtained between 600 and 800°, and the slope of each I-V curve was determined in the ohmic region between 10 and 20 mA, giving the total effective **area specific resistance** (ASR cell) of the cell under load as a function of **temperature** The bulk **electrolyte** resistivity was found by taking the difference in resistance of two cells divided by the difference in **electrolyte** thickness. The bulk conductivity of the **electrolyte** measured at 1000 K by this technique was 5 mS/cm or less, depending on the overall **electrolyte** thickness, much lower than the values obtained by impedance spectroscopy. Also, the activation energy for bulk conduction was higher than expected for pure protonic transport. This paper attempts to correlate the two measurement techniques and explain the apparent discrepancies.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 45 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:763550 Document No. 140:184546 Synthesis and characterisation of cermet anodes for **SOFCs** with a **proton-conducting** ceramic phase. Mather, G. C.; Figueiredo, F. M.; Jurado, J. R.; Frade, J. R. (Camino de Valdelatas s/n, Instituto de Ceramica y Vidrio, CSIC, Madrid, 28049, Spain). Solid State Ionics, 162-163, 115-120 (English) 2003. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Cermet anodes of Ni-CaZr0.95Y0.05O2.975 (Ni-CZY) and Ni-SrZr0.95Y0.05O2.975 (Ni-SZY) were synthesized by combustion followed by sintering and reduction to Ni **metal.** The anodes were co-pressed and co-sintered on green YSZ electrolyte to produce anode/electrolyte/anode assemblies with planar electrodes of thickness, .apprx.150 μm. The anode microstructures are composed of a uniform and homogeneous distribution of submicron Ni **metal** and ceramic phases. Preliminary impedance spectroscopy results on sym. cells indicate that the polarization resistance is composed of two or more pH2O-sensitive contributions and is dependent on the composition of the **proton-conducting** ceramic.

IT **162824-28-4P**, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O2.98)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses)
(sintered anode cermet with nickel; synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)

RN 162824-28-4 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O2.98) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	2.98	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 75, 76

ST cermet anode **SOFCs proton conducting** ceramic SEM XRD impedance; nickel zirconium calcium yttrium

strontium oxide conductance orthorhombic perovskite
IT Electric impedance
(of **fuel cells**; synthesis and
characterization of nickel cermet anodes for **SOFCs** with
proton-conducting ceramic phase)
IT Polarization resistance
(on sym. **fuel cells**; synthesis and
characterization of nickel cermet anodes for **SOFCs** with
proton-conducting ceramic phase)
IT Crystal structure types
(orthorhombic; synthesis and characterization of nickel cermet
anodes for **SOFCs** with **proton-**
conducting ceramic phase)
IT Electrodes
(planar, for **fuel cells**; synthesis and
characterization of nickel cermet anodes for **SOFCs** with
proton-conducting ceramic phase)
IT **Ionic conductivity**
(**proton**; synthesis and characterization of nickel
cermet anodes for **SOFCs** with **proton-**
conducting ceramic phase)
IT **Fuel cells**
(solid oxide; synthesis and characterization of nickel cermet
anodes for **SOFCs** with **proton-**
conducting ceramic phase)
IT Cermets
Combustion synthesis
Electric **conductors**, ceramic
Fuel cell anodes
Microstructure
Reduction
Sintering
(synthesis and characterization of nickel cermet anodes for
SOFCs with **proton-conducting** ceramic
phase)
IT 114168-16-0, TZ-8Y
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(YSZ, cermet anodes attached to; synthesis and characterization
of nickel cermet anodes for **SOFCs** with **proton**
-conducting ceramic phase)
IT 57-13-6, Urea, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(combustion fuel; synthesis and characterization of nickel cermet
anodes for **SOFCs** with **proton-**
conducting ceramic phase)
IT 1313-99-1, Nickel oxide (NiO), uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
reagent); USES (Uses)
(phase in anode cermet before reduction; synthesis and
characterization of nickel cermet anodes for **SOFCs** with
proton-conducting ceramic phase)
IT 12036-39-4P, Strontium zirconium oxide (SrZrO3)
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); PREP (Preparation); USES (Uses)
(phase in anode cermet; synthesis and characterization of nickel
cermet anodes for **SOFCs** with **proton-**
conducting ceramic phase)
IT **162824-28-4P**, Strontium yttrium zirconium oxide
(SrY0.05Zr0.95O2.98) 657398-56-6P, Calcium yttrium zirconium oxide
(CaY0.05Zr0.95O2.98)
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); SPN (Synthetic
preparation); PREP (Preparation); PROC (Process); USES (Uses)
(sintered anode cermet with nickel; synthesis and

characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 7440-02-0P, Nickel, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 7732-18-5, Water, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(yttria-stabilized; synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)
IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(zirconia stabilized by; synthesis and characterization of nickel cermet anodes for **SOFCs** with **proton-conducting** ceramic phase)

L379 ANSWER 46 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:738047 Document No. 139:248046 Method for manufacturing polymer **electrolyte** type **fuel cell.** Ueyama, Yasuhiro; Watanabe, Masaru; Kamikihara, Nobuyuki; Yasumoto, Eiichi (Matsushita Electric Industrial Co., Ltd., Japan). PCT Int. Appl. WO 2003077336 A1 20030918, 50 pp. DESIGNATED STATES: W: CA, CN, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2003-JP2973 20030313. PRIORITY: JP 2002-70350 20020314.
AB A method for manufacturing a polymer **electrolyte** type **fuel cell** having a polymer **electrolyte** film and, arranged on both **sides** thereof, electrodes containing a catalyst layer and a gas diffusion layer being contacted with the polymer **electrolyte** film, and a separator contacted with the gas diffusion layer, characterized in that, in the formation of the catalyst layer through applying a paste containing a carbon fine powder comprising a noble **metal** catalyst carried on a specific **support**, followed by drying, the electrode is controlled to have a **percentage** of the **surface** area occupied by cracked portions below a predetd. acceptable level, through adjusting at least (1) the film thickness of the catalyst layer, (2) the type of the catalyst comprising carbon and a noble **metal** carried thereon and (3) the drying rate for the solvent in the paste. For example, a film thickness of 10 to 25 μm, a carbon carrying 5 to 20 **wt** % of platinum, and a drying rate for the solvent of 2.5 to 20

mg/cm2/ min are employed.
IC ICM H01M004-88
ICS H01M008-02; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST polymer **electrolyte fuel cell** precious
metal platinum catalyst drying
IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**; manufacture of platinum catalyst layer **supported** on carbon black for polymer **electrolyte** -type **fuel cell**)
IT Drying
Fuel cells
(manufacture of platinum catalyst layer **supported** on carbon black for polymer **electrolyte**-type **fuel cell**)
IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); EPR (Engineering process); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(catalyst; manufacture of platinum catalyst layer **supported** on carbon black for polymer **electrolyte**-type **fuel cell**)

L379 ANSWER 47 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:697777 Document No. 139:367423 **Fuel cells** operating in the "**gap**" **temperature** regime.
Smotkin, Eugene S. (Department of Chemistry, University of Puerto Rico @ Rio Piedras, San Juan, 00931, P. R.). Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry, 48(2), 887-888 (English) 2003. CODEN: PSADFZ. ISSN: 1521-4648.
Publisher: American Chemical Society, Division of Fuel Chemistry.
AB An intermediate **temperature electrolyte** system enabling **fuel cell** operation between 250 °C and 400°C, i.e., in the **gap** between a PEM **fuel cell** and a molten carbonate **fuel cell** (MCFC) has the benefits of enhanced ORR kinetics, CO tolerance, and a simplified fuel processor without the materials thermal instability problems of the high **temperature** systems. Addnl., the **gap temperature** region enables downward scalability for portable power, a power regime not accessible by MCFCs. Inorg. electronically insulating **proton conductors** are candidates for **gap electrolytes** and a composite membrane **electrolyte** was prepared by coating **ammonium polyphosphate** and **silica** spheres on a Pd foil. A **fuel cell** operating in the **gap** regime with this **electrolyte** was demonstrated. Within the **gap** regime, a water-gas-shift reactor and a PROX reactor will not be needed and the intermediate **temperature** operation will permit downward scalability for portable power.
IT **7440-05-3**, Palladium, uses
RL: DEV (Device component use); USES (Uses)
(**fuel cell** operating at intermediate **temps.** with **electrolyte** coated on)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST phosphoric acid silica palladium composite **electrolyte fuel cell**
IT Polyphosphoric acids

RL: DEV (Device component use); USES (Uses)
(ammonium **salts**, composite with silica,
electrolyte; fuel cell operating at
intermediate **temps.** with)
IT **Fuel cell electrolytes**
Fuel cells
(**fuel cell** operating at intermediate
temps.)
IT 7631-86-9, Silica, uses
RL: DEV (Device component use); USES (Uses)
(composite with ammonium polyphosphate, **electrolyte**;
fuel cell operating at intermediate
temps. with)
IT 1333-74-0, Hydrogen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**fuel cell** operating at intermediate
temps. fueled with)
IT 630-08-0, Carbon monoxide, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**fuel cell** operating at intermediate
temps. fueled with hydrogen containing)
IT **7440-05-3**, Palladium, uses
RL: DEV (Device component use); USES (Uses)
(**fuel cell** operating at intermediate
temps. with **electrolyte** coated on)
IT 7782-44-7, Oxygen, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical
process); PROC (Process)
(in **fuel cell** operating at intermediate
temps.)

L379 ANSWER 48 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:677263 Document No. 140:130991 Development of low-cost
alloy supported SOFCs. Visco, Steven
J.; Jacobson, Craig P.; Villareal, Igor; Leming, Andy; Matus, Yuriy;
De Jonghe, Lutgard C. (Materials Sciences Division, Lawrence
Berkeley National Laboratory, Berkeley, CA, 94720, USA).
Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells
VIII (SOFC VIII)), 1040-1050 (English) 2003. CODEN: PESODO. ISSN:
0161-6374. Publisher: Electrochemical Society.
AB The LBNL group has been developing ferritic steel **supported**
solid oxide **fuel cells.** The use of ferritic
steel as a **support** for electrode **supported** solid
oxide **fuel cells** greatly reduces the raw
materials cost and improves the strength of the thin-**film**
cells. The basic design includes the use of a high-strength FeCr
support, a thin interlayer electrode (**Ni**-YSZ or
other), and a thin **electrolyte film.** The entire
structure is fabricated through co-firing of the three
layers in a reducing environment. This paper describes the
preliminary performance of the **metal supported**
cells, as well as a variety of possible interlayer electrodes.
IT **7440-02-0, Nickel,** uses
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(development of low-cost **alloy supported**
SOFCs)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 76

ST alloy support SOFC low cost
IT Polyoxyalkylenes, uses
Polyvinyl butyrals
RL: NUU (Other use, unclassified); USES (Uses)
(development of low-cost **alloy supported SOFCs**)
IT **Fuel cells**
(solid oxide; development of low-cost **alloy supported SOFCs**)
IT **Alloys**, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**supports**; development of low-cost **alloy supported SOFCs**)
IT 1313-99-1, **Nickel** oxide NiO, uses **7440-02-0**, **Nickel**, uses 7440-06-4, Platinum, uses 12017-94-6, **Chromium lanthanum** oxide (CrLaO3) 12060-59-2, Strontium **titanium** oxide (SrTiO3) 12597-68-1, Stainless steel, uses 148595-66-8, Cobalt **iron lanthanum** strontium oxide (Co0.2Fe0.8La0.6Sr0.4O3) 254760-18-4, **Lanthanum** strontium **titanium** oxide (La0.65Sr0.35TiO3) 403694-09-7, 8YSZ 439900-64-8, Cobalt strontium **titanium** yttrium oxide (Co0.05Sr0.85Ti0.95Y0.1O3) 649758-60-1
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(development of low-cost **alloy supported SOFCs**)
IT 57-11-4, Stearic acid, uses 67-63-0, 2-Propanol, uses 25322-68-3, PEG
RL: NUU (Other use, unclassified); USES (Uses)
(development of low-cost **alloy supported SOFCs**)
IT 11100-60-0, Steel, **chromium**, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(ferritic; development of low-cost **alloy supported SOFCs**)

L379 ANSWER 49 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:677189 Document No. 140:18256 Improvement of LSM cathode for high power density SOFCs. Wang, Wei Guo; Barfod, Rasmus; Larsen, Peter Halvor; Kammer, Kent; Bentzen, Janet J.; Hendriksen, Peter Vang; Mogensen, Mogens (Materials Research Department, Riso National Laboratory, Roskilde, DK-4000, Den.). Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC VIII)), 400-408 (English) 2003. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
AB Optimization of processing (La1-xSrx)yMnO3±δ composite cathodes led to high-performance **SOFCs.** Sym. cells were prepared with (La1-xSrx)yMnO3±δ composite cathodes on yttria-stabilized zirconia tapes. A homogeneous microstructure with submicron pores was obtained that resulted in a low **area-specific** polarization **resistance** of 0.09 at 850° and 0.31 Ω·cm2 at 750°, while **area-specific** series **resistances** were 0.29 and 0.61 Ω·cm2, resp., in a sym. cell with a yttria-stabilized zirconia tape 185 **.mu.m** thick. The low area-specific polarization and series resistance are attributed to long triple-phase boundaries and good adhesion between cathode and **electrolyte.** Impedance measurements indicated an activation energy of the cathode of 1.26 eV. Anode-**supported** cells with an active area of 4+4 cm2 show a high power d. of 1.44 W/cm2 at 850° and 0.8 W/cm2 at 750° at a cell voltage of 0.7 V.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 50 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:677168 Document No. 140:18253 Characterization of cathode **supported** thin **film** electrolytes. Becker, M.; Weber, A.; Mueller, A. C.; Ivers-Tiffee, E. (Institut fuer Werkstoffe, Institut fuer Werkstoffe der Elektrotechnik Universitaet Karlsruhe, Adenauerring 20, Karlsruhe, 76131, Germany). Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC VIII)), 222-228 (English) 2003. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB The lower operating **temperature** limit of **SOFCs** is governed by the thermally activated conductance of the **electrolyte** as well as by the polarization resistance of the electrodes. For operating **temps.** lower than 800. **degree.C, supported** thin **film electrolytes** can be applied to reduce the ohmic losses within a single cell. In this work, cathode **supported** thin **film electrolytes** from state-of-the-art ceria and zirconia **electrolyte** powders were realized using mass production technologies. The conductivity of the **electrolyte** thin **film** was determined by impedance spectroscopy and the microstructure was characterized by electron microscopy methods (SEM). The conductivity of the **electrolyte** thin **film** (thickness < 10 **.mu.m**) depends on grain size and porosity. The conductivity values of state-of- the-art **electrolyte** substrates (thickness > 150 **.mu.m**) have not been achieved so far. However, the contribution of the **electrolyte** thin **film** to the **area specific resistance** is significantly smaller compared to the ASR of an **electrolyte supported** single cell.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76

ST cathode **supported** thin **film** oxide **electrolytes SOFC**

IT Cathodes
Electrolytes
Films
(cathode **supported** thin **film** electrolytes)

IT Grain size
Porosity
(effect on elec. conductivity of cathode **supported** thin **film** oxide **electrolytes** for **SOFC**'s)

IT Electric conductivity
Electric impedance
Microstructure
(of cathode **supported** thin **film** oxide **electrolytes** for **SOFC**'s)

IT **Fuel cells**
(solid oxide; cathode **supported** thin **film electrolytes** for)

IT 1306-38-3, Ceria, uses
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(gadolinia doped; cathode **supported** thin **film electrolytes** for **SOFC**'s)

IT 157975-54-7, Lanthanum manganese strontium oxide La0.75MnSr0.2O3
RL: DEV (Device component use); USES (Uses)
(thin **film** oxide **electrolytes** for **SOFC**'s **supported** on cathode)

IT 1314-23-4, Zirconia, uses
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(yttria doped; cathode **supported** thin **film electrolytes** for **SOFC**'s)

L379 ANSWER 51 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:631929 **Fuel cells** operating in the "**Gap**

" **temperature** regime. Smotkin, Eugene S. (Department of Chemistry, University of Puerto Rico, San Juan, 00931, P. R.). Abstracts of Papers, 226th ACS National Meeting, New York, NY, United States, September 7-11, 2003, FUEL-177. American Chemical Society: Washington, D. C. (English) 2003. CODEN: 69EKY9.

AB An intermediate **temperature electrolyte** system enabling **fuel cell** operation at 250°C to 400°C (i.e. in the **gap** between the PEM **fuel cell** and the MCFC) has the benefits of enhanced ORR kinetics, CO tolerance, and a simplified fuel processor without the materials thermal instability problems of the high **temperature** systems. We report the first demonstration of a **fuel cell** operating in the **gap** regime. The innovation is a **support** structure that enables the use of very thin inorg. electronically insulating **proton conductors** (EIPCs). The composite **electrolyte** system is based on an EIPC **supported** on a thin **metal hydride** membrane that is strong, flexible, and has excellent hydrogen transport properties. The **metal hydride** is **coated** on one or both **sides** with a thin **film** of the inorg. EIPC. By themselves, neither the **metal hydride** foil nor the EIPC can make an acceptable **fuel cell** membrane. The **metal** alone, being an electronic **conductor**, would short circuit the cathode and anode; the EIPC alone has poor mech. properties and may also be fuel-permeable. Together, the two components form an electronically insulating, mech. strong, fuel impermeable thin membrane that is ideally suited to the intermediate **temperature** regime.

L379 ANSWER 52 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:581659 Document No. 139:397834 **Metal-Supported** Solid Oxide **Fuel Cells.** Villarreal, I.; Jacobson, C.; Leming, A.; Matus, Y.; Visco, S.; De Jonghe, L. (Ikerlan Technological Research Center, Parque Tecnologico de Alava, Alava, Minano Menor, 01510, Spain). Electrochemical and Solid-State Letters, 6(9), A178-A179 (English) 2003. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB Low-cost, colloidal deposition methods were used to produce novel solid oxide **fuel cell** (**SOFC**) structures on **metal alloy support** electrodes. Yttria-stabilized zirconia (YSZ) **films** were deposited on **Fe**-chrome **supports** on top of a thin **Ni**/YSZ catalytic **layer** and sintered at 1350° in a reducing atmospheric Dense, 20 **.mu.m** YSZ **electrolyte films** were obtained on highly porous stainless steel substrates. **Metal-supported fuel cells** were tested at 800 and 900°, achieving power densities of over 200 mW/cm2 at 900° using Pt paste cathodes. The cells showed excellent resistance to thermal cycling, and open up a low-cost path to **SOFC** commercialization.

IT **7440-02-0, Nickel**, uses
RL: DEV (Device component use); USES (Uses)
(steel **coated** with; **metal-supported** solid oxide **fuel cells** with)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST stainless steel **support** anode solid oxide **fuel cell**

IT **Fuel cell** anodes
(**metal-supported** solid oxide **fuel cells**)
IT **Fuel cells**
(solid oxide; **metal-supported** solid oxide **fuel cells**)
IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); USES (Uses)
(cathode containing; **metal-supported** solid oxide **fuel cells** with)
IT 115135-47-2, Cobalt **iron lanthanum** strontium oxide ($Co0.8Fe0.2La0.6Sr0.4O3$)
RL: DEV (Device component use); USES (Uses)
(cathode; **metal-supported** solid oxide **fuel cells** with)
IT 11109-78-7
RL: DEV (Device component use); USES (Uses)
(**nickel**- and yttria-stabilized zirconia-**coated**; **metal-supported** solid oxide **fuel cells** with)
IT **7440-02-0, Nickel**, uses 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); USES (Uses)
(steel **coated** with; **metal-supported** solid oxide **fuel cells** with)
IT 1314-23-4, Zirconium oxide (ZrO_2), uses
RL: DEV (Device component use); USES (Uses)
(yttria-doped; **metal-supported** solid oxide **fuel cells** with)
IT 1314-36-9, Yttrium oxide (Y_2O_3), uses
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(zirconia doped with; **metal-supported** solid oxide **fuel cells** with)

L379 ANSWER 53 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:560619 Document No. 139:294488 Fe-based catalysts for the reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions: determination of the amount of peroxide released during electroreduction and its influence on the stability of the catalysts. Lefevre, Michel; Dodelet, Jean-Pol (INRS-Energie et Materiaux, Varennes, 1020, Can.). Electrochimica Acta, 48(19), 2749-2760 (English) 2003. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier Science B.V..

AB Fe-based catalysts have been prepared by pyrolyzing ClFeTMPP (Cl-Fe tetramethoxyphenyl porphyrin) or Fe acetate adsorbed on PTCDA (perylene tetracarboxylic dianhydride) or on prepyrolyzed PTCDA (p-PTCDA). The catalysts which were already well characterized in terms of active FeN_4/C and FeN_2/C catalytic sites (J. Phys. Chemical B 106 (2002) 8705) are now characterized by RRDE expts. to determine the values of the apparent number of electron transferred (n) and the **percentage** of peroxide (%H_2O_2) released during the oxygen reduction reaction (ORR) in H_2SO_4 at pH 1. A direct correlation is found between the relative abundance of the FeN_2/C catalytic site in these materials, their catalytic activity and the value of n. The correlation is inverse for %H_2O_2. The best catalysts at their maximum catalytic activity are characterized by $n>3.9$ and %$H_2O_2<5$%, equivalent to a value of %H_2O_2 released by a 2 **weight**% Pt/C catalyst. It is shown that even low peroxide levels of the order of 5 vol% in H_2SO_4 are able to decompose the catalytic sites releasing iron **ions** in the H_2SO_4 solution The loss of catalytic activity correlates directly with the loss of iron **ions** by these catalysts. All the catalysts have been tested at the cathode of single membrane electrode assemblies (MEAs). The slow decrease in performance in **fuel cell** stability tests is interpreted as the result of the detrimental effect that has H_2O_2,

released during ORR, on the chemical integrity of the nonnoble **metal** catalytic sites at work at the **fuel cell** cathodes.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 29, 67, 72
IT **Fuel cells**
Polymer **electrolytes**
(Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT Electric potential
(effect on H2O2 formation on Fe-based catalysts in polymer **electrolyte** membrane **fuel cell**)
IT Catalysts
(electrocatalysts; Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT **Electrolytic** cells
(membrane; Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT **Surface** analysis
(of Fe-based catalysts in polymer **electrolyte** membrane **fuel cell**)
IT **Electrolytic** polarization
(of Fe-based catalysts in polymer **electrolyte** membrane **fuel cell** conditions in H2SO4 solution)
IT Reduction, electrochemical
(of oxygen in polymer **electrolyte** membrane **fuel cell** conditions on Fe-based catalysts)
IT Thermal decomposition
(preparation of Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** by)
IT Electrodes
(rotating disk electrodes; reduction of oxygen on Fe-based catalysts in polymer **electrolyte** membrane **fuel cell** on stability of the catalysts)
IT 37191-17-6
RL: CAT (Catalyst use); USES (Uses)
(Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT 7782-44-7, Oxygen, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT 128-69-8, Perylene tetracarboxylic dianhydride
RL: NUU (Other use, unclassified); USES (Uses)
(bare and prepyrolyzed; reduction of oxygen in polymer **electrolyte** membrane **fuel cell** on iron acetate adsorbed on)
IT 7439-89-6, Iron, uses
RL: CAT (Catalyst use); USES (Uses)
(containing; Fe-based catalysts for reduction of oxygen in polymer **electrolyte** membrane **fuel cell** conditions)
IT 7722-84-1, Hydrogen peroxide, processes
RL: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
(formation by oxygen reduction on Fe-based catalysts in polymer **electrolyte** membrane **fuel cell** conditions)
IT 7664-93-9, Sulfuric acid, uses

RL: NUU (Other use, unclassified); USES (Uses)
(oxygen reduction on Fe-based catalysts in polymer **electrolyte** membrane **fuel cell** conditions in solution containing)

IT 2140-52-5, Iron acetate
RL: CAT (Catalyst use); USES (Uses)
(reduction of oxygen in polymer **electrolyte** membrane **fuel cell** on iron acetate adsorbed on perylene tetracarboxylic dianhydride)

IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); MSC (Miscellaneous); USES (Uses)
(**support** for Fe-based catalysts in polymer **electrolyte** membrane **fuel cell**)

L379 ANSWER 54 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:531579 Document No. 139:103729 Manufacture of solid polymer-type fuel cell and manufacture of gas diffusion electrode. Tanuma, Toshihiro; Kinoshita, Shinji; Shimoda, Hiroshi (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003197205 A2 20030711, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-393246 20011226.

AB The invention relates to a gas diffusion electrode of a solid polymer-type **fuel cell** which is disposed adjacent to an **ion**-exchange membrane and contains a catalyst and a F-based **ion**-exchange resin and a **metal supported** on carbon. The catalyst (Wc) and the **ion** exchange resin (Wf) are mixed and dispersed in a liquid to form a solution (A) at a weight ratio $0.05 \leq Wf/Wr \leq 0.5$ so that the catalyst particle with ≤1 **.mu.m** occupies ≥30 volume% in the particle size distribution. The **ion**-exchange resin is added to the solution (A) so as to satisfy Wf/Wc = 0.7-1.7 to form a solution (B). The solution (B) is used to form the gas diffusion electrode. The process was able to form the gas diffusion electrode having high durability.

IC ICM H01M004-88
ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 67

ST solid polymer **fuel cell** gas diffusion electrode; **ion** exchange resin catalysts **fuel cell**

IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**; gas diffusion electrode of solid polymer-type fuel cell)

IT Catalysts
Fuel cell cathodes
Ion exchangers
(gas diffusion electrode of solid polymer-type **fuel cell**)

L379 ANSWER 55 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:521059 Document No. 139:119789 **Metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems. Myers, Deborah J.; Krebs, John F.; Carter, J. David; Kumar, Romesh; Krumpelt, Michael (Chemical Technology Division, Argonne National Laboratory, Argonne, IL, 60439-4837, USA). Pre-Print Archive - American Institute of Chemical Engineers, [Spring National Meeting], New Orleans, LA, United States, Mar. 11-14, 2002, 2308-2312. American Institute of Chemical Engineers: New York, N. Y. (English) 2002. CODEN: 69DXU5.

AB Several doped ceria catalysts were tested on their activity to promote the water-gas shift (WGS) reaction . A Pt/doped ceria/γ-alumina catalyst was found that had a WGS activity comparable to the com. **Cu**/ZnO catalyst, and unlike other com. WGS catalysts it had not to be activated by in situ reduction, and showed no loss of activity upon exposure to air at 21-550°.

The catalyst showed activity in the **temperature** range 180-400° and could be used in high and low **temperature** shift reactions. This properties of the Pt/doped ceria catalyst made it suitable for fuel processing in mobile applications, but the high costs of the catalysts might prohibit their use in light duty vehicles.
IT **7440-05-3, Palladium**, uses
RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
(dopant; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST was gas shift catalyst ceria **fuel cell** hydrogen
IT Electric vehicles
(automobiles; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT Automobiles
(elec.; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT **Surface** area
Water gas shift reaction catalysts
(**metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT **Fuel cells**
(polymer-**electrolyte**; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT Fuel gas manufacturing
(water gas manufacturing; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT **7440-05-3, Palladium**, uses 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses 7440-48-4, Cobalt, uses
RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
(dopant; **metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT 1306-38-3, Ceria, uses 117655-32-0, Cerium gadolinium oxide (Ce0.8Gd0.2O1.9) 197149-44-3, Cerium samarium oxide (Ce0.85Sm0.15O1.92) 461412-51-1, Cerium praseodymium zirconium oxide (Ce0.8Pr0.02Zr0.17O1.99) 461412-52-2, Cerium yttrium zirconium oxide (Ce0.8Y0.1Zr0.1O1.95) 461412-53-3, Cerium gadolinium zirconium oxide (Ce0.8Gd0.02Zr0.17O1.99)
RL: CAT (Catalyst use); USES (Uses)
(**metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT 1333-74-0P, Hydrogen, preparation
RL: IMF (Industrial manufacture); PREP (Preparation)
(**metal**/ceria water-gas shift catalysts for automotive polymer **electrolyte fuel cell** systems)
IT 1344-28-1, Alumina, uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)

(**support**; **metal**/ceria water-gas shift
catalysts for automotive polymer **electrolyte**
fuel cell systems)

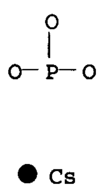
L379 ANSWER 56 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:435140 Document No. 139:9315 Solid acid electrolytes for electrochemical devices. Haile, Sossina M.; Chisholm, Calum; Merle, Ryan B.; Boysen, Dane A.; Narayanan, Sekharipuram R. (USA). U.S. Pat. Appl. Publ. US 2003104258 A1 20030605, 29 pp., Cont.-in-part of U.S. 6,468,684. (English). CODEN: USXXCO. APPLICATION: US 2002-211882 20020801. PRIORITY: US 1999-PV116741 19990122; US 1999-PV146946 19990802; US 1999-PV151811 19990830; US 1999-439377 19991115.

AB Improved solid acid electrolyte materials, methods of synthesizing such materials, and electrochem. devices incorporating such materials are provided. The stable electrolyte material comprises a solid acid capable undergoing rotational disorder of oxyanion groups and capable of extended operation at elevated **temps.**, i.e., solid acids having hydrogen bonded anion groups; a superprotonic, trigonal, tetragonal, or cubic, disordered phase; and capable of being operating at **temps.** of .apprx.100° and higher.

IT **13569-78-3P**, Cesium phosphite (CsH2PO3)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)

RN 13569-78-3 HCAPLUS

CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE

IC ICM H01M008-10
ICS H01M006-18; C01B025-30; C01B025-45

INCL 429033000; 423306000; 423307000; 429304000; 429321000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72, 76

ST **electrolyte** solid acid electrochem device; **fuel cell electrolyte** solid acid; capacitor **electrolyte** solid acid; sensor **electrolyte** solid acid; hydrogen sepn membrane **electrolyte** solid acid

IT Conducting polymers
Electrolytic capacitors
Fuel cell electrolytes
Ion exchange
Sensors
Solid electrolytes
(solid acid **electrolytes** for electrochem. devices)

IT **13569-78-3P**, Cesium phosphite (CsH2PO3) 22021-54-1P, Barium hydrogen silicate BaH2SiO4 22112-04-5P, Calcium sodium hydrogen silicate CaNaHSiO4 42035-64-3P 60746-55-6P, Strontium germanate(IV) (SrH2GeO4)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)

L379 ANSWER 57 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:253809 Document No. 138:404193 Stability of the dry

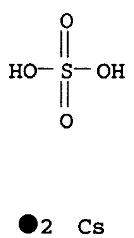
proton conductor CsHSO4 in hydrogen atmosphere.
Yang, B.; Kannan, A. M.; Manthiram, A. (Materials Science and Engineering Program, The University of Texas at Austin, Austin, TX, 78712, USA). Materials Research Bulletin, 38(4), 691-698 (English) 2003. CODEN: MRBUAC. ISSN: 0025-5408. Publisher: Elsevier Science Inc..

AB The suitability of the dry p **conductor**, CsHSO4 as an **electrolyte** for **fuel cells**, was assessed by studying its chemical stability in a H2 atmosphere in the presence of the electrocatalyst, Pt/C. X-ray diffraction and differential scanning calorimetric (DSC) data indicate that CsHSO4 decomps. to Cs2SO4 and H2S at 150° in a H2 atmosphere when it is mixed with Pt/C catalyst but, it is stable under identical conditions in the absence of the Pt/C catalyst. Although thin composite membranes (.apprx.80 μm) prepared with poly(vinylidene fluoride) and CsHSO4 exhibit high p conductivity at 150-200°, which is adequate for **fuel cell** applications, development of compatible non-platinum alloys or transition **metal** oxide catalysts is needed before CsHSO4 can be used as an **electrolyte** in **fuel cells.** Processing procedures must be optimized to obtain dense, gas-impermeable membranes suitable for **fuel cell** application.

IT **10294-54-9**, Cesium sulfate (Cs2SO4)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(decomposition of dry **proton conductor**, cesium bisulfate, in hydrogen atmospheric)

RN 10294-54-9 HCAPLUS

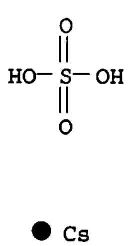
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



IT **7789-16-4**, Cesium sulfate (CsHSO4)
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(stability of dry **proton conductor**, cesium bisulfate, in hydrogen atmospheric)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76

ST cesium bisulfate **proton conductor** stability hydrogen **fuel cell electrolyte**; **fuel cell** membrane polyvinylidene fluoride cesium

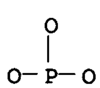
bisulfate
IT **Fuel cell** separators
(fabrication of **fuel cell** membrane by casting
slurry of poly(vinylidene fluoride) and cesium bisulfate)
IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(fabrication of **fuel cell** membrane by casting
slurry of poly(vinylidene fluoride) and cesium bisulfate)
IT Ionic **conductors**
(**protonic**; stability of dry **proton**
conductor, cesium bisulfate, in hydrogen atmospheric)
IT **Fuel cell electrolytes**
(stability of dry **proton conductor**, cesium
bisulfate, in hydrogen atmospheric)
IT 7783-06-4, Hydrogen sulfide (H2S), formation (nonpreparative)
10294-54-9, Cesium sulfate (Cs2SO4)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(decomposition of dry **proton conductor**, cesium
bisulfate, in hydrogen atmospheric)
IT 24937-79-9, Poly(vinylidene fluoride)
RL: DEV (Device component use); USES (Uses)
(fabrication of **fuel cell** membrane by casting
slurry of poly(vinylidene fluoride) and cesium bisulfate)
IT **7789-16-4**, Cesium sulfate (CsHSO4)
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
reagent); USES (Uses)
(stability of dry **proton conductor**, cesium
bisulfate, in hydrogen atmospheric)
IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(stability of dry **proton conductor**, cesium
bisulfate, in hydrogen atmospheric)
IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); USES (Uses)
(stability of dry **proton conductor**, cesium
bisulfate, in hydrogen atmospheric with)
IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); USES (Uses)
(**support**; stability of dry **proton**
conductor, cesium bisulfate, in hydrogen atmospheric with)

L379 ANSWER 58 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:200697 Document No. 138:240574 Structure of electrochemical
reaction baseplate. Yo, Ko-Shen; Tsai, Min-Chieh; Wu, Ja-Lin; Luo,
Lei-Hsi (Industrial Technology Research Institute, Taiwan). Jpn.
Kokai Tokkyo Koho JP 2003077489 A2 20030314, 5 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 2001-256664 20010827.
AB The title baseplate has high functionality and is suited for use in
manufacturing of fuel cell, electrochem. reactor, or detector. The
baseplate is made of a plate material having multiple ditches of a
desired width/depth ratio, multiple though-holes of desired
dimension formed on the baseplate, electrolysis layer formed on the
surface the inside though-**holes**, a selective
insulation layer formed on the electrolysis layer, a porous
elec. conductive layer formed on the insulation layer, and a
catalyst layer formed on the conductive layer. The double layered
material is formed by sandwiching a selective insulation layer with
a pair of baseplates.
IT **7440-05-3**, Palladium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(structure of electrochem. reaction baseplate for manufacturing of fuel
cell, electrochem. reactor, or detector)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-02
ICS C25B009-10; C25B011-03; H01M004-86
CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
IT **Electrolytic** cells
Fuel cells
Sensors
(structure of electrochem. reaction baseplate for manufacturing of **fuel cell**, electrochem. reactor, or detector)
IT **7440-05-3**, Palladium, uses 7440-06-4, Platinum, uses 7440-42-8, Boron, uses 7440-57-5, Gold, uses 7782-40-3, Diamond, uses 7782-42-5, Graphite, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(structure of electrochem. reaction baseplate for manufacturing of fuel cell, electrochem. reactor, or detector)

L379 ANSWER 59 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:118173 Document No. 138:156301 Method of synthesis of solid acid electrolytes for electrochemical devices. Haile, Sossina M.; Chisholm, Calum; Merle, Ryan B.; Boysen, Dane; Narayanan, Sekharipuram R. (California Institute of Technology, USA). PCT Int. Appl. WO 2003012894 A2 20030213, 51 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US24564 20020801. PRIORITY: US 2001-PV309807 20010801; US 2002-PV355362 20020206.
AB Improved solid acid electrolyte materials, methods of synthesizing such materials, and electrochem. devices incorporating such materials are disclosed. The stable electrolyte material comprises a solid acid capable undergoing rotational disorder of oxyanion groups and capable of extended operation at elevated **temps** ., i.e., solid acids having hydrogen bonded anion groups; a superprotonic, trigonal, tetragonal, or cubic, disordered phase; and capable of being operating at **temps.** of .apprx.100° and higher.
IT **13569-78-3P**
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(method of synthesis of solid acid electrolytes for electrochem. devices)
RN 13569-78-3 HCAPLUS
CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE
IC ICM H01M
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72, 76

ST fuel cell solid acid electrolyte
synthesis; electrochem device solid acid electrolyte
synthesis
IT Glass, uses
Metals, uses
Polymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(binder; method of synthesis of solid acid electrolytes for
electrochem. devices)
IT Battery electrolytes
Conducting polymers
Electric conductivity
Fuel cell electrolytes
Ion exchange
Membranes, nonbiological
Solid electrolytes
(method of synthesis of solid acid electrolytes for
electrochem. devices)
IT Ionic conductivity
(proton; method of synthesis of solid acid electrolytes
for electrochem. devices)
IT 67-56-1, Methanol, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fuel cell; method of synthesis of solid acid
electrolytes for electrochem. devices)
IT 13569-78-3P 22021-54-1P, Barium hydrogen silicate BaH2SiO4
22112-04-5P, Calcium sodium hydrogen silicate CaNaHSiO4
22112-05-6P 28263-33-4P 42035-64-3P, Silicic acid (H4SiO4),
disodium salt, pentahydrate 60746-55-6P
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); PREP (Preparation); USES (Uses)
(method of synthesis of solid acid electrolytes for electrochem.
devices)

L379 ANSWER 60 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:36428 Document No. 138:89590 Method for preparation of
hydrogenated fullerene by hydrogenation of fullerene using
ruthenium, palladium, iridium, platinum, or cobalt
supported on activated alumina. Ozaki, Toshihiko; Tai,
Yutaka (National Institute of Advanced Industrial Science and
Technology, Japan). Jpn. Kokai Tokkyo Koho JP 2003012572 A2
20030115, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
2001-191005 20010625.
AB Hydrogenated fullerene is prepared by conversion of C60 fullerene into
from C60H18 to C60H36 under mild hydrogenation conditions using one
of Ru, Pd, Ir, Pt, and Co metal
supported on an activated alumina. Also claimed is a method
for storage of hydrogen by above conversion of C60 fullerene into
from C60H18 to C60H36. The hydrogenation catalyst is prepared by
impregnation of activated alumina in an aqueous solution of metal
salt selected from ruthenium chloride, palladium
chloride, iridium chloride, platinum chloride, and cobalt nitrate,
evaporation of water, drying, and firing at 400-800°. The
catalyst obtained is hydrogenated at 400-800° under hydrogen
atmospheric before its use. This process highly efficiently gives in high
yield with high selectivity and without decomposition, hydrogenated
fullerene which is useful as light-weight hydrogen storage material
with higher hydrogen storage ratio (.apprx.2.4 weight % and .apprx.4.8
weight% C60H18 and C60H36, resp.) as compared to metal-based
hydrogen storage material (e.g. 1.4 weight% for LaNi5H6) and may find
an application for fuel cell automobile. Thus,
50 mg C60 fullerene and 10 weight% Co/10 g activated alumina in 200 mL
toluene were hydrogenated in an autoclave at 150° for 300 min
to give a mixture of hydrogenated C60 fullerene containing from C60H18 to
C60H36 with 100% conversion ratio.
IT 7440-05-3D, Palladium, supported on

activated alumina
RL: CAT (Catalyst use); USES (Uses)
(preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C013-64
ICS B01J023-42; B01J023-44; B01J023-46; B01J023-75; B01J037-02; B01J037-08; B01J037-18; C07C005-02; C07B061-00
CC 25-29 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)
ST hydrogenated fullerene prepn hydrogen storage material; fullerene hydrogenation; ruthenium **supported** activated alumina hydrogenation catalyst; **palladium supported** activated alumina hydrogenation catalyst; iridium **supported** activated alumina hydrogenation catalyst; platinum **supported** activated alumina hydrogenation catalyst; cobalt **supported** activated alumina hydrogenation catalyst
IT Fullerenes
RL: SPN (Synthetic preparation); PREP (Preparation)
(hydrogenated; preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
IT Hydrogenation
Hydrogenation catalysts
(preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
IT 1344-28-1, Alumina, uses
RL: CAT (Catalyst use); USES (Uses)
(activated, catalyst **support**; preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
IT 7439-88-5D, Iridium, **supported** on activated alumina **7440-05-3D, Palladium, supported** on activated alumina 7440-06-4D, Platinum, **supported** on activated alumina 7440-18-8D, Ruthenium, **supported** on activated alumina 7440-48-4D, Cobalt, **supported** on activated alumina
RL: CAT (Catalyst use); USES (Uses)
(preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
IT 1333-74-0, Hydrogen, reactions 7647-10-1, **Palladium** chloride 10025-83-9, Iridium chloride 10049-08-8, Ruthenium chloride 10141-05-6, Cobalt nitrate 12648-47-4, Platinum chloride 99685-96-8, C60 Fullerene
RL: RCT (Reactant); RACT (Reactant or reagent)
(preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)
IT 99685-96-8DP, C60 Fullerene, hydrogenated 130797-14-7P, Octadecahydrofullerene-C60 130797-17-0P, Hexatriacontahydrofullerene-C60
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of hydrogenated fullerene as hydrogen storage material by hydrogenation of fullerene using Ru, **Pd**, Ir, Pt, or Co **supported** on activated alumina)

L379 ANSWER 61 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:35310 Document No. 138:58968 Hydrogen generation via methane cracking for integrated heat and electricity production using a fuel cell. Sioui, Daniel R.; Towler, Gavin P.; Oroskar, Anil R.; Zhou, Lubo; Dunne, Stephen R.; Kulprathipanja, Santi; Galperin, Leonid B.; Modica, Frank S.; Voskoboinikov, Timur V. (UOP LLC, USA). U.S. US 6506510 B1 20030114, 14 pp. (English). CODEN: USXXAM. APPLICATION: US 2000-737990 20001215.

AB A novel integrated system for the co-production of heat and electricity for residences or com. buildings is based on the cracking of hydrocarbons to generate hydrogen for a fuel cell. Compared to prior art reforming methods for hydrogen production, the cracking reaction provides an input stream to the fuel cell that is essentially free of CO, a known poison to the anode catalyst in many fuel cell designs, such as PEM fuel cells. The cracking reaction is coupled with an air or steam regeneration cycle to reactivate that cracking catalyst for further use. This regeneration can provide a valuable source of heat or furnace fuel to the system. A novel control method for system adjusts the durations of the cracking and regeneration cycles to optimize the recovery of reaction heat.

IT **7440-05-3, Palladium**, uses **12735-99-8**
RL: TEM (Technical or engineered material use); USES (Uses)
(H-permeable membrane; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 12735-99-8 HCAPLUS
CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component Registry Number
Ag	7440-22-4
Pd	7440-05-3

IT **7439-89-6, Iron**, uses **7440-02-0, Nickel**, uses
RL: CAT (Catalyst use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IT 7440-62-2, **Vanadium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

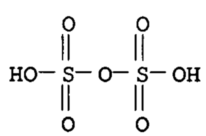
V

IC ICM H01M008-04
ICS H01M008-12; H01M002-14
INCL 429017000; 429026000; 429039000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
IT **Hydrides**
RL: FMU (Formation, unclassified); TEM (Technical or engineered material use); FORM (Formation, nonpreparative); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
IT **Fuel cells**
(solid **electrolyte**; hydrogen generation via methane cracking for integrated heat and electricity production using **fuel cell**)
IT Clays, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
IT **7440-05-3, Palladium**, uses **12735-99-8**
71174-06-6 93977-71-0
RL: TEM (Technical or engineered material use); USES (Uses)
(H-permeable membrane; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses **7439-89-6**
, **Iron**, uses **7440-02-0, Nickel**, uses
RL: CAT (Catalyst use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
IT **7440-32-6, Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)
IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7440-03-1, Niobium, uses 7440-25-7, Tantalum, uses **7440-62-2**, **Vanadium**, uses 7440-67-7, Zirconium, uses 7631-86-9, Silica, uses 12597-68-1, Stainless steel, uses 13463-67-7, Titania, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

L379 ANSWER 62 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:902388 Document No. 138:124940 Instability of Sulfate and Selenate Solid Acids in **Fuel Cell** Environments.
Merle, Ryan B.; Chisholm, Calum R. I.; Boysen, Dane A.; Haile, Sossina M. (California Institute of Technology Materials Science, Pasadena, CA, 91125, USA). Energy & Fuels, 17(1), 210-215 (English) 2003. CODEN: ENFUEM. ISSN: 0887-0624. Publisher: American Chemical Society.
AB The chemical and thermal stability of several solid acid compds. under **fuel cell** operating conditions was investigated,

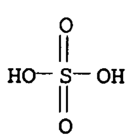
primarily by thermogravimetric methods. Thermal decomposition of CsHSO4, a material which has shown promise as an alternative **electrolyte** for proton exchange membrane (PEM) **fuel cells**, initiates decomposition at .apprx.175° under inert conditions. The overall decomposition process can be expressed as 2CsHSO4 → Cs2SO4 + H2O + SO3, with Cs2S2O7 appearing as an intermediate byproduct at slow heating rates. Under reducing conditions, chemical decomposition can occur via reaction with hydrogen according to 2CsHSO4 + 4H2 → Cs2SO4 + 4H2O + H2S. In the absence of **fuel cell** catalysts, this reduction reaction is slow; however, materials such as Pt, Pd, and WC are highly effective in catalyzing the reduction of sulfur and the generation of H2S. In the case of M3H(XO4)2 compds. (M = Cs, NH4, or Rb; X = S or Se), a similar reduction reaction occurs: 2M3H(XO4)2 + 4H2 → 3M2XO4 + 4H2O + H2X. In an operational **fuel cell** based on CsHSO4, performance degraded with time, presumably as a result of H2S poisoning of the anode catalyst. The performance loss was recoverable by exposure of the **fuel cell** to air at 160°.

IT **50992-48-8P**, Disulfuric acid, dicesium **salt**
RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
(formation of; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
RN 50992-48-8 HCAPLUS
CN Disulfuric acid, dicesium salt (9CI) (CA INDEX NAME)



●2 Cs

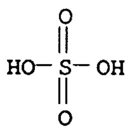
IT **10294-54-9**, Cesium sulfate
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(formation of; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
RN 10294-54-9 HCAPLUS
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

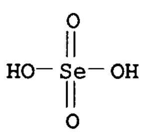
IT **7789-16-4**, Cesium hydrogen sulfate **63317-98-6**
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**fuel cell electrolyte**; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane

fuel cells)
RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 63317-98-6 HCAPLUS
CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)



●3/2 NH_3

IT **7440-05-3**, Palladium, uses
RL: CAT (Catalyst use); USES (Uses)
(thermal decomposition catalyst; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 78
ST **fuel cell** cesium bisulfate solid acid **electrolyte**; hydrogen sulfide poisoning **fuel cell** anode sulfate decompn; alkali **metal** bisulfate solid acid **fuel cell electrolyte**
IT Acids, uses
RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses)
(inorg., solid; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT **Fuel cell electrolytes**
Fuel cell separators
(instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT Thermal decomposition
(of inorg. solid acids; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel**

cells)
IT Battery anodes
(slow poisoning of; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT **50992-48-8P**, Disulfuric acid, dicesium **salt**
RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
(formation of; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT 7446-11-9, Sulfur trioxide, formation (nonpreparative) 7783-06-4, Hydrogen sulfide, formation (nonpreparative) **10294-54-9**, Cesium sulfate
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(formation of; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT **7789-16-4**, Cesium hydrogen sulfate 13775-30-9 **63317-98-6** 71555-62-9 231277-45-5, Cesium phosphate sulfate (Cs2(H2PO4)(HSO4))
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**fuel cell electrolyte**; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT 7664-93-9D, Sulfuric acid, alkali **metal** hydrogen and ammonium hydrogen **salts** 7783-08-6D, Selenic acid, alkali **metal** hydrogen and ammonium hydrogen **salts**
RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses)
(**fuel cell electrolytes**; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
IT **7440-05-3**, Palladium, uses 7440-06-4, Platinum, uses 12070-12-1, Tungsten carbide (WC)
RL: CAT (Catalyst use); USES (Uses)
(thermal decomposition catalyst; instability of alkali **metal** and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)

L379 ANSWER 63 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:886578 Document No. 137:387085 Porous **metal support** for cell stack and cell plate for solid oxide **fuel cell.** Shibata, Itaru; Yamanaka, Mitsugu; Sato, Fumitoshi; Hatano, Shoji; Kushibiki, Keiko; Hara, Naoki; Fukuzawa, Tatsuhiro; Uchiyama, Makoto (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002334706 A2 20021122, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-137049 20010508.
AB The title **support** is equipped with a porous **metal** body for connecting to a cell stack and a reinforcement made of a material having resistance to oxidation and reduction The title cell plate is equipped with the above **support** connected to an anode **layer** or a cathode **layer** of the **fuel cell.** The **support** has high strength and thermal deformation resistance.
IT **7440-02-0**, **Nickel**, uses **7440-22-4**, **Silver**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforced porous **metal support** for cell stack and cell plate for solid oxide **fuel cell**)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT **12735-99-8**
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforcement; reinforced porous **metal support** for cell stack and cell plate for solid oxide **fuel cell**)
RN 12735-99-8 HCAPLUS
CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component Registry Number
Ag	7440-22-4
Pd	7440-05-3

IC ICM H01M008-02
ICS H01M008-02; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST porous **metal support** reinforcement solid oxide **fuel cell**
IT **Fuel cells**
(solid **electrolyte**; reinforced porous **metal support** for cell stack and cell plate for solid oxide **fuel cell**)
IT **7440-02-0, Nickel**, uses **7440-22-4, Silver**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforced porous **metal support** for cell stack and cell plate for solid oxide **fuel cell**
)
IT 11101-13-6 11101-28-3 11105-45-6 12606-02-9, Inconel 12649-48-8 12728-71-1 **12735-99-8** 66174-72-9 175783-53-6
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforcement; reinforced porous **metal support** for cell stack and cell plate for solid oxide **fuel cell**)

L379 ANSWER 64 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:849988 Document No. 137:355431 **Metal-supported** solid electrolyte electrochemical cell and multi-cell reactors incorporating same. Tunney, Cathal Joseph; Roy, Robert Donald; McClure, Fraser (3825892 Canada Inc., Can.; Alberta Research Council Inc.). PCT Int. Appl. WO 2002089243 A2 20021107, 61 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-CA582 20020426. PRIORITY: US 2001-2001/PV28685U 20010427; US

2001-2001/PV30302U 20010703; US 2001-2001/PV326561 20011002.

AB The invention provides a **metal-supported** solid electrolyte electrochem. cell, multi cell reactor assemblies incorporating a plurality of such cells, and processes of forming the electrochem. cells. In one embodiment, the electrochem. cell includes a central electrolyte membrane, first and second perforated **metallic layers** adhered to each of the major **surfaces** of the central electrolyte membrane, and first and second outer, non-porous electrolyte **layers** formed above the **metallic layers.** In another embodiment, first and second inner, porous electrolyte **layers** are sandwiched on either **side** of the central membrane, between the first and second **metallic layers.** The electrochem. cell is thus generally formed from ceramic material as thin **layers supported** on non-porous, robust **metallic layers,** designed to behave as though made of **metal.** Preferably, the electrochem. cell includes **metallurgically** bonded elec. interconnects and/or gas seals.

IT **7440-02-0, Nickel,** uses **7440-05-3, Palladium,** uses **7440-22-4, Silver,** uses **7440-47-3, Chromium,** uses
RL: DEV (Device component use); USES (Uses)
(**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

IC ICM H01M008-12
ICS H01M008-24; B01D053-32; B01J019-00; C01B003-38
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48, 49, 55, 72
ST electrochem cell **metal supported** solid **electrolyte; fuel cell metal supported** solid **electrolyte;** oxygen concn cell **metal supported** solid **electrolyte;** reactor multiple cell **metal supported** solid **electrolyte**
IT Sol-gel processing
(**coating; metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Brazing
(inert atmospheric; **metal-supported** solid
electrolyte electrochem. cell and multi-cell reactors
incorporating same)
IT Electric contacts
Electrodeposition
Electron beam evaporation
Interconnections, electric
Oxidation catalysts
Perovskite-type crystals
Photolithography
Reactors
Reforming catalysts
Seals (parts)
Sputtering
(**metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT Oxides (inorganic), uses
Rare earth **metals**, uses
RL: CAT (Catalyst use); USES (Uses)
(**metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT Hydrocarbons, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical
process); PROC (Process)
(**metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT Oxidation
(partial, cell; **metal-supported** solid
electrolyte electrochem. cell and multi-cell reactors
incorporating same)
IT Etching
(photochem.; **metal-supported** solid
electrolyte electrochem. cell and multi-cell reactors
incorporating same)
IT Fuel gas manufacturing
(reforming; **metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT **Coating** process
(sol-gel; **metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT **Fuel cells**
(solid **electrolyte**; **metal-supported**
solid **electrolyte** electrochem. cell and multi-cell
reactors incorporating same)
IT **Alloys**, uses
RL: DEV (Device component use); USES (Uses)
(super **alloys**, **Ni**-bases; **metal-**
supported solid electrolyte electrochem. cell and
multi-cell reactors incorporating same)
IT Brazing
(vacuum; **metal-supported** solid electrolyte
electrochem. cell and multi-cell reactors incorporating same)
IT **Nickel alloy**, base
RL: DEV (Device component use); USES (Uses)
(superalloy; **metal-supported** solid
electrolyte electrochem. cell and multi-cell reactors
incorporating same)
IT 7782-44-7P, Oxygen, preparation
RL: PUR (Purification or recovery); PREP (Preparation)
(concentration cell; **metal-supported** solid
electrolyte electrochem. cell and multi-cell reactors
incorporating same)
IT 1304-76-3, Bismuth oxide, uses 1306-38-3, Ceria, uses
RL: DEV (Device component use); USES (Uses)
(doped; **metal-supported** solid electrolyte

electrochem. cell and multi-cell reactors incorporating same)
IT 7705-08-0, Ferric chloride, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(etchant; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)
IT 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); USES (Uses)
(ferritic; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)
IT 57285-40-2, **Chromium lanthanum** strontium oxide
RL: CAT (Catalyst use); USES (Uses)
(**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)
IT 1314-23-4, Zirconia, uses **7440-02-0, Nickel**, uses **7440-05-3, Palladium**, uses 7440-06-4, Platinum, uses **7440-22-4, Silver**, uses **7440-47-3, Chromium**, uses 7440-57-5, Gold, uses 11122-73-9 20667-12-3, **Silver** oxide 55575-02-5, Cerium gadolinium oxide 94076-32-1, Haynes 230
RL: DEV (Device component use); USES (Uses)
(**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)
IT 1314-36-9, Yttria, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(zirconia stabilized with, **coating**; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

L379 ANSWER 65 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:719422 Document No. 138:109502 **Temperature**-Dependence of Methanol Oxidation Rates at PtRu and Pt Electrodes. Wakabayashi, Noriaki; Uchida, Hiroyuki; Watanabe, Masahiro (Clean Energy Research Center, Yamanashi University, Takeda 4, Kofu, 400-8511, Japan). Electrochemical and Solid-State Letters, 5(11), E62-E65 (English) 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.
AB High **temperature** operation of direct methanol **fuel cells** is essential from the viewpoint of achieving a high performance with reduced amts. of Pt electrocatalysts used. A thin-layer flow cell of 0.1 mm **gap** is applied to evaluate the activity of PtRu (46 atom % Ru) alloy and Pt electrodes for methanol oxidation reaction (MOR) in a wide **temperature** range from 20 to 120° in 1 M MeOH + 0.1 M $HClO_4$ solution under pressurized operation. The steady electrocatalytic activity could be evaluated by linear potential-sweep voltammetry under a certain **electrolyte** flow rate (> 0.2 mL/s), which eliminated an effect of the oxidation current of hydrogen evolved at the proximate counter cathode. Onset potentials [vs. reversible hydrogen electrode (RHE)] for the MOR shifted linearly to less pos. potentials with elevating **temperature**, e.g., from 0.45 V (at 20°) to 0.34 V (at 120°) on the PtRu electrode and from 0.66 to 0.52 V on the Pt electrode, resp. A low apparent activation energy of 16 kJ/mol for the MOR was found on PtRu at 0.45 to 0.55 V, which was smaller than that of 24 kJ/mol on Pt at 0.70 V.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST methanol oxidn electrochem cell platinum ruthenium electrode **temp** effect
IT Oxidation kinetics
(electrochem.; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT **Surface** roughness
(of Pt and PtRu electrodes; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT Cyclic voltammetry
Electric current-potential relationship

Fuel cell electrodes
Linear-sweep voltammetry
Overvoltage
Oxidation, electrochemical
(**temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT Electrochemical cells
(thin-layer flow; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 7601-90-3, Perchloric acid, uses
RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(aqueous solution, electrolyte; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 7440-57-5, Gold, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(disk, electrode **support**; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 7440-06-4, Platinum, uses 488118-24-7
RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); USES (Uses)
(sputter-coated electrode; **temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 67-56-1, Methanol, uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 124-38-9, Carbon dioxide, formation (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(**temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)
IT 1333-74-0P, Hydrogen, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(**temperature**-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

L379 ANSWER 66 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:268457 Document No. 136:281515 Steam reforming method for producing hydrogen-rich gas without supplying external heat. Kaneko, Tomoko; Yoshida, Noriko; Yamashita, Toshio; Kawasaki, Terufumi (Hitachi Ltd., Japan; Babcock-Hitachi K. K.). Jpn. Kokai Tokkyo Koho JP 2002104808 A2 20020410, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-299102 20000927.
AB A source gas containing O (or air), hydrocarbons, and steam is brought in contact with a catalyst for simultaneously accelerating the oxidation reaction and steam-reforming reaction of the hydrocarbons. The catalyst comprises **Pd**, Pt, Ru, or Rh, optionally with **Ni**, Co, **Fe**, **Ag**, **Cu**, Zn, **Cr**, and/or rare earth **metals supported** on a porous carrier comprising Al-containing oxide. In the catalyst, amts. of the active elements for accelerating the reactions are regulated for balancing the exothermic heat from the oxidation reaction and the endothermic heat from the steam-reforming reaction, so that the **temperature** of the whole catalyst can be kept at a desired **temperature** without supplying heat from the exterior.
IT **7439-91-0**, **Lanthanum**, uses
RL: CAT (Catalyst use); USES (Uses)
(carrier; steam reforming method for producing H-rich gas by using catalyst without supplying external heat)
RN 7439-91-0 HCAPLUS
CN Lanthanum (8CI, 9CI) (CA INDEX NAME)

La

IT **7440-02-0, Nickel**, uses **7440-05-3, Palladium**, uses **7440-22-4, Silver**, uses **7440-47-3, Chromium**, uses **7440-50-8, Copper**, uses
RL: CAT (Catalyst use); USES (Uses)
(steam reforming method for producing H-rich gas by using catalyst without supplying external heat)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C01B003-40
ICS B01J023-10; B01J032-00; C01B003-48; H01M008-06; H01M008-10
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST steam reforming catalyst **temp** control hydrogen prodn
IT **Fuel cells**
(solid **electrolyte**; steam reforming method for producing H-rich gas by using catalyst without supplying external heat)
IT Rare earth **metals**, uses
RL: CAT (Catalyst use); USES (Uses)
(steam reforming method for producing H-rich gas by using catalyst without supplying external heat)
IT 1302-88-1, Cordierite 1302-93-8, Mullite 1344-28-1, Alumina, uses **7439-91-0, Lanthanum**, uses
RL: CAT (Catalyst use); USES (Uses)
(carrier; steam reforming method for producing H-rich gas by using catalyst without supplying external heat)
IT 7439-89-6, **Iron**, uses **7440-02-0, Nickel**, uses **7440-05-3, Palladium**, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium,

uses **7440-22-4**, **Silver**, uses **7440-47-3**
, **Chromium**, uses 7440-48-4, Cobalt, uses
7440-50-8, **Copper**, uses 7440-66-6, Zinc, uses
RL: CAT (Catalyst use); USES (Uses)
(steam reforming method for producing H-rich gas by using catalyst without supplying external heat)

L379 ANSWER 67 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:199509 Document No. 137:9494 Ceramic-based materials for electrochemical applications. Linkov, V.; Petrik, L.; Vaivars, G.; Maluleke, A.; Gericke, G. (Inorganic Porous Media Group, University of the Western Cape, Bellville, S. Afr.). Macromolecular Symposia, 178(Polymer Characterization and Materials Science), 153-168 (English) 2002. CODEN: MSYMEC. ISSN: 1022-1360. Publisher: Wiley-VCH Verlag GmbH.
AB A review. Novel catalytic ceramic-based materials that simultaneously possess high **surface** area and adsorptive capacity, with proton and/or electron conducting properties, were developed for electrocatalytic and waste-stream treatment processes. These novel inorg. **proton conducting** membranes were produced by incorporating inorg. low-**temperature** **proton conductors** such as polymeric phosphates of polyvalent **metals** into the porous structure of different active or inert substrates such as ceramics (in the form of tubes, disks and paper), zeolites or carbon cloth. Electrocatalytic activity was obtained by coating electroconductive **surface** layers that acted both as electrode and catalyst. Bench scale and pilot scale test reactors were built and commissioned. Comparison with existing technologies was undertaken for several applications. Such high **surface**-area inorg. materials that **support** nanoscale **metal** clusters are being tested as electrode materials in anodic oxidation, inorg. **fuel cells** and hydrogen generation.
CC 57-0 (Ceramics)
Section cross-reference(s): 52, 60, 72
ST review ceramic membrane **proton conducting** wastewater treatment phenol oxidn; ceramic membrane **proton conducting fuel cell** separator review
IT **Fuel cell** separators
(ceramic-based materials for electrochem. applications)
IT Ceramic membranes
(**proton-conducting**; ceramic-based materials for electrochem. applications)

L379 ANSWER 68 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:107738 Document No. 136:153925 Hydrogen permeable membrane for use in **fuel cells**, and partial reformate **fuel cell** system having reforming catalysts in the anode **fuel cell** compartment. Smotkin, Eugene S. (Nuvant Systems, LLC, USA). PCT Int. Appl. WO 2002011226 A2 20020207, 58 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US20032 20010622. PRIORITY: US 2000-PV222128 20000731; US 2000-PV244208 20001031.
AB An electronically insulating **proton conductor** is adhered or deposited as a film on a dense phase proton permeable material in a thickness such that the composite C/D has a **proton conductivity** in a preferred intermediate **temperature** range of 175-550°. The composite C/D is incorporated in a high **temperature electrolyte**

membrane **electrolyte** assembly (MEA), which is incorporated into a **fuel cell** that can operate in this intermediate **temperature** range. The **fuel cell** in turn is incorporated into a **fuel cell** system having a fuel reformer in the flow field of a fuel mixture entering the **fuel cell** or in a mode where the **fuel cell** receives **fuel** from an external reformer.

IT **7440-02-0**, **Nickel**, uses **7440-05-3**, **Palladium**, uses **7440-32-6**, **Titanium**, uses **7440-62-2**, **Vanadium**, uses **12023-04-0**, **Feti 12196-72-4** **18649-05-3**, Cesium Dihydrogen phosphate **153328-13-3D** , Strontium yttrium zirconium oxide SrY0.1Zr0.9O3, O-deficient **191980-68-4**, Barium calcium niobium oxide Ba3Ca1.18Nb1.82O8.73 **251566-28-6**, **Lanthanum** magnesium scandium strontium oxide La0.9Mg0.1Sc0.9Sr0.1O3 **395656-87-8D**, Barium cerium gadolinium zirconium oxide (BaCe0.5-0.9Gd0.1Zr0-0.4O3), O-deficient **395656-88-9**

RL: DEV (Device component use); USES (Uses)

(hydrogen permeable membrane for use in **fuel cells** and partial reformate **fuel cell** system having reforming catalysts in anode **fuel cell** compartment)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12023-04-0 HCAPLUS
CN Iron, compd. with titanium (1:1) (8CI, 9CI) (CA INDEX NAME)

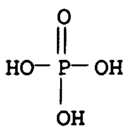
Component	Ratio	Component Registry Number
Ti	1	7440-32-6
Fe	1	7439-89-6

RN 12196-72-4 HCAPLUS
CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component

		Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 153328-13-3 HCAPLUS
CN Strontium yttrium zirconium oxide (SrY0.1Zr0.9O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 191980-68-4 HCAPLUS
CN Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O8.73) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

RN 251566-28-6 HCAPLUS
CN Lanthanum magnesium scandium strontium oxide (La0.9Mg0.1Sc0.9Sr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Sr	0.1	7440-24-6
Sc	0.9	7440-20-2
Mg	0.1	7439-95-4
La	0.9	7439-91-0

RN 395656-87-8 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.5-0.9Gd0.1Zr0-0.4O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0 - 0.4	7440-67-7

```
Gd              |     0.1        |      7440-54-2
Ce              |   0.5 - 0.9    |      7440-45-1
Ba              |      1         |      7440-39-3
```

RN   395656-88-9 HCAPLUS
CN   Vanadium alloy, base, V 66,Cr 34 (9CI) (CA INDEX NAME)

```
Component   Component      Component
              Percent    Registry Number
=========+============+===============
    V          66            7440-62-2
    Cr         34            7440-47-3
```

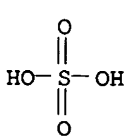
IC   ICM H01M008-10
CC   52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST   **fuel cell** hydrogen permeable membrane; reforming
     catalyst anode **fuel cell** compartment
IT   Electric **conductors**
       Fuel cell anodes
       Fuel cell electrolytes
       Fuel cells
     Membranes, nonbiological
     Reforming catalysts
     Synthesis gas manufacturing
     Water gas shift reaction
        (**hydrogen** permeable membrane for use in **fuel**
        cells and partial reformate **fuel cell**
        system having reforming catalysts in anode **fuel**
        cell compartment)
IT   Polyphosphates
     RL: DEV (Device component use); USES (Uses)
        (hydrogen permeable membrane for use in **fuel**
        cells and partial reformate **fuel cell**
        system having reforming catalysts in anode **fuel**
        cell compartment)
IT   **Hydrides**
     RL: TEM (Technical or engineered material use); USES (Uses)
        (hydrogen permeable membrane for use in **fuel**
        cells and partial reformate **fuel cell**
        system having reforming catalysts in anode **fuel**
        cell compartment)
IT   **Ionic conductors**
        (**protonic**; hydrogen permeable membrane for use in
        fuel cells and partial reformate **fuel**
        cell system having reforming catalysts in anode
        fuel cell compartment)
IT   Fuel gas manufacturing
        (reforming; hydrogen permeable membrane for use in **fuel**
        cells and partial reformate **fuel cell**
        system having reforming catalysts in anode **fuel**
        cell compartment)
IT   **Palladium** alloy, base
     RL: DEV (Device component use); USES (Uses)
        (hydrogen permeable membrane for use in **fuel**
        cells and partial reformate **fuel cell**
        system having reforming catalysts in anode **fuel**
        cell compartment)
IT   **7440-02-0, Nickel**, uses **7440-05-3,**
     Palladium, uses **7440-32-6, Titanium,**
     uses **7440-62-2, Vanadium**, uses
     12023-04-0, Feti 12196-72-4
     18649-05-3, Cesium Dihydrogen phosphate **153328-13-3D**
     , Strontium yttrium zirconium oxide SrY0.1Zr0.9O3, O-deficient
     191980-68-4, Barium calcium niobium oxide
     Ba3Ca1.18Nb1.82O8.73 **251566-28-6, Lanthanum**
     magnesium scandium strontium oxide La0.9Mg0.1Sc0.9Sr0.1O3

395656-87-8D, Barium cerium gadolinium zirconium oxide
(BaCe0.5-0.9Gd0.1Zr0-0.4O3), O-deficient **395656-88-9**
RL: DEV (Device component use); USES (Uses)
(hydrogen permeable membrane for use in **fuel cells** and partial reformate **fuel cell** system having reforming catalysts in anode **fuel cell** compartment)
IT 1333-74-0P, Hydrogen, uses
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(hydrogen permeable membrane for use in **fuel cells** and partial reformate **fuel cell** system having reforming catalysts in anode **fuel cell** compartment)
IT 67-56-1, Methanol, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrogen permeable membrane for use in **fuel cells** and partial reformate **fuel cell** system having reforming catalysts in anode **fuel cell** compartment)

L379 ANSWER 69 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:859525 Document No. 136:121015 Approaches and technical challenges to high **temperature** operation of proton exchange membrane **fuel cells.** Yang, C.; Costamagna, P.; Srinivasan, S.; Benziger, J.; Bocarsly, A. B. (Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ, 08540, USA). Journal of Power Sources, 103(1), 1-9 (English) 2001. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB Water loss and the coincident increase in membrane resistance to **proton conduction** are significant barriers to high performance operation of traditional proton exchange membrane **fuel cells** at elevated **temps.** where the relative humidity may be reduced. We report here approaches to the development of high-**temperature** membranes for proton exchange membrane **fuel cells**; composite perfluorinated sulfonic acid membranes were prepared to improve water retention, and nonaq. **proton conducting** membranes were prepared to circumvent the loss of water. Exptl. results of composite membranes of Nafion and **zirconium phosphate** show improved operation at elevated **temps.** Imidazole impregnated membranes poisoned the electrocatalysts. Cesium hydrogen sulfate membranes were not able to produce appreciable current. A brief anal. of **temperature** requirements for CO tolerance and a framework for understanding water loss from **fuel cell** membranes are presented.

IT **7789-16-4**, Cesium hydrogen sulfate
RL: DEV (Device component use); USES (Uses)
(composite membrane containing; approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells** with)
RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST proton exchange membrane **fuel cell** operation
IT **Fuel cells**
(approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells**)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**; approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells** with)
IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**; approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells** with)
IT **Ionomers**
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells** with)
IT 288-32-4, Imidazole, uses **7789-16-4**, Cesium hydrogen sulfate 13772-29-7, **Zirconium** hydrogen **phosphate** [Zr(HPO4)2] 77950-55-1, Nafion 115
RL: DEV (Device component use); USES (Uses)
(composite membrane containing; approaches and tech. challenges to high-**temperature** operation of proton exchange membrane **fuel cells** with)

L379 ANSWER 70 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:638121 Porous oxide **electrolyte** membranes for **fuel cells.** Tejedor-Tejedor, M. Isabel; Anderson, Marc A. (Environmental Chemistry and Technology Program, University of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 222nd ACS National Meeting, Chicago, IL, United States, August 26-30, 2001, COLL-085. American Chemical Society: Washington, D. C. (English) 2001. CODEN: 69BUZP.
AB Background: We fabricate microporous oxide membranes as alternatives to organic polymeric **electrolytes** in PEM **fuel cells.** These materials should operate at much higher **temps.** (>150 °C) than organic polymers while still retaining water, which helps resolve problems with water management and carbon monoxide poisoning. These membranes are cast as thin films directly on and then fired to the cathode and anode. This intimate contact may alleviate charge transfer limitations at the electrode/membrane interface. For future scale-up, membrane electrode assemblies that incorporate microporous inorg. membranes should be easily fabricated using tape or gel-casting techniques, making this process com. viable. Our previous research has shown that crack-free inorg. membranes can be deposited on porous nickel **supports. Proton conductivities** of these materials as measured across a micro-porous monolith can reach 5x10-2 S/cm at 25 °C and 81% relative humidity, corresponding to a specific resistivity of 2x10-3 Ω-cm2. Currently, these membranes are being incorporated in test cells for further evaluation at Los Alamos. To date, we have measured **proton conductivities** of TiO2 materials at **temps.** to 15-40 °C and humidities from 33-90%. Gas permeabilities of TiO2 membranes on **supports** have also been measured. Preliminary conductivity data on SiO2 and Al2O3 are favorable, but we have yet to test mixed oxides. Energies of activation for **conducting protons** through TiO2 depend on the number of water mols./nm2. Two operating regimes and mechanisms are apparent: 1.) Ea decreases with increasing water content and 2.) Ea increases with increasing water coverage. The abrupt change in

mechanism at the min. occurs when the pores fill with water. Ea also depends on the **surface** chemical of the pore wall (i.e., degree of protonation and type of **surface** bound species). Therefore, **surface** chemical and pore morphol. (size and shape) should greatly affect **proton conductivity** in TiO2 membranes.

L379 ANSWER 71 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:339933 Document No. 135:112221 Atomistic diffusion mechanism in high **temperature proton conductors.**
Hempelmann, R.; Gross, B. (Physikalische Chemie, Universitat des Saarlandes, Saarbrucken, D-66123, Germany). Schriften des Forschungszentrums Juelich, Reihe Energietechnik/Energy Technology, 15(Pt. 2, High Temperature Materials Chemistry, Part 2), 597-600 (English) 2000. CODEN: SFJTF2. ISSN: 1433-5522. Publisher: Forschungszentrum Juelich GmbH.

AB From the point of view of applied research these materials have attracted attention because of applications as hydrogen sensors and possible applications as **proton conducting electrolytes** in solid oxide **fuel cells** (**SOFC**). From the point of view of fundamental research these materials exhibit complex proton transport properties and thus represent a challenge both for experimentalists and theoreticians. In the present contribution we will briefly summarize our scientific contributions to the elucidation of the proton diffusion mechanism. We have applied quasielastic neutron scattering and - with the pos. muon as radioactive tracer for the proton - muon spin relaxation. Both these powerful microscopic (atomistic) techniques have not been used before in connection with **proton conducting** oxides. To **support** the novel results obtained in these ways we have performed impedance spectroscopy to measure the **proton conductivity** and 15N nuclear resonance reaction analyses to investigate the thermodn. of water vapor absorption.

IT **158634-63-0D**, Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O9), oxygen deficient
RL: PRP (Properties)
(water vapor pressure/composition isotherms)

RN 158634-63-0 HCAPLUS

CN Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 65-4 (General Physical Chemistry)
Section cross-reference(s): 76

ST diffusion mechanism high **temp proton conductor**

IT Diffusion
Ionic **conductors**
Muon spin rotation
Neutron scattering
Perovskite-type crystals
(QENS and μSR studies of diffusion mechanism in high **temperature proton conductors**)

IT Ionic **conductivity**
(**proton**; QENS and μSR studies of diffusion mechanism in high **temperature proton conductors**)

IT 12408-02-5, Hydrogen ion, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)

(QENS and µSR studies of diffusion mechanism in high **temperature proton conductors**)
IT 123082-62-2D, Cerium strontium ytterbium oxide ((Ce,Yb)SrO3), oxygen deficient 349654-60-0D, Barium ytterbium zirconium oxide (Ba(Yb,Zr)O3), oxygen deficient 349654-61-1D, Scandium strontium zirconium oxide ((Sc,Zr)SrO3), oxygen deficient
RL: PRP (Properties)
(QENS and µSR studies of diffusion mechanism in high **temperature proton conductors**)
IT **158634-63-0D**, Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O9), oxygen deficient
RL: PRP (Properties)
(water vapor pressure/composition isotherms)

L379 ANSWER 72 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:299258 Document No. 134:313632 **Fuel cell** electrodes made of polymer **electrolyte**-catalyst composites, and their manufacture. Hitomi, Shuji (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001118582 A2 20010427, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-297302 19991019.
AB The electrodes contain cation exchange resins, C particles, and catalyst **metals** having cores and outer **layers.** The cores comprise 1-4 **metals** selected from Pt, Ru, Rh, **Pd**, and Ir. The outer **layers** contain Pt, Ru, Rh, **Pd**, and/or Ir but use the **metals** different from the cores. The amount of catalyst **metals supported** on the C particles in contact with **H+-conducting** passages in the resins is >50% of total catalyst **metals supported.** The electrode manufacturing processes including 2-stage adsorption and reduction of cations, are also described. The electrodes have high resistance to CO catalyst poisoning, activity to oxidation of MeOH, and utilization and **alloying** ratio of the catalyst **metals.**
IT **7440-05-3, Palladium,** uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**fuel cell** electrodes containing **cation** exchange resins, C particles, and core-shell catalyst **metals**, and their manufacture for high catalyst activity)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-90
ICS H01M004-88; H01M004-92; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** electrode polymer **electrolyte** catalyst composite; **cation** exchange resin **fuel cell** electrode; carbon particle **fuel cell** electrode; **metal** catalyst **fuel cell** electrode
IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**, Vulcan XC 72; **fuel cell** electrodes containing **cation** exchange resins, C particles, and core-shell catalyst **metals**, and their manufacture for high catalyst activity)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**, Nafion; **fuel cell** electrodes containing **cation**

exchange resins, C particles, and core-shell catalyst
metals, and their manufacture for high catalyst activity)
IT **Cation** exchangers
Fuel cell electrodes
(**fuel cell** electrodes containing **cation**
exchange resins, C particles, and core-shell catalyst
metals, and their manufacture for high catalyst activity)
IT Fluoropolymers, uses
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**, Nafion;
fuel cell electrodes containing **cation**
exchange resins, C particles, and core-shell catalyst
metals, and their manufacture for high catalyst activity)
IT **Ionomers**
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, Nafion;
fuel cell electrodes containing **cation**
exchange resins, C particles, and core-shell catalyst
metals, and their manufacture for high catalyst activity)
IT 7439-88-5, Iridium, uses **7440-05-3**, **Palladium**,
uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses
7440-18-8, Ruthenium, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical
process); PROC (Process); USES (Uses)
(**fuel cell** electrodes containing **cation**
exchange resins, C particles, and core-shell catalyst
metals, and their manufacture for high catalyst activity)

L379 ANSWER 73 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:296206 Document No. 135:79358 Non-stoichiometry, grain boundary
transport and chemical stability of **proton**
conducting perovskites. Haile, S. M.; Staneff, G.; Ryu, K.
H. (Materials Science, California Institute of Technology, Pasadena,
CA, 91125, USA). Journal of Materials Science, 36(5), 1149-1160
(English) 2001. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Kluwer
Academic Publishers.
AB The interrelationship between defect chemical, non-stoichiometry, grain
boundary transport and chemical stability of **proton**
conducting perovskites (doped alkaline earth cerates and
zirconates) has been investigated. Non-stoichiometry, defined as
the deviation of the A:M molar ratio in AMO3 from 1:1, dramatically
impacts conductivity, sinterability and chemical stability with respect to
reaction with CO2. In particular, alkaline earth deficiency encourages
dopant incorporation onto the A-atom site, rather than the intended
M-atom site, reducing the concentration of oxygen vacancies. Transport
along grain boundaries is, in general, less favorable than transport
through the bulk, and thus only in fine-grained materials does
microstructure impact the overall elec. properties. The chemical
stability of high conductivity cerates is enhanced by the introduction of
Zr. The conductivity of BaCe0.9-xZrxM0.1O3 perovskites monotonically
decreases with increasing x (increasing Zr content), with the impact
of Zr substitution increasing in the order M = Yb → Gd
→ Nd. Furthermore, the magnitude of the conductivity follows the
same sequence for a given zirconium content. This result is
interpreted in terms of dopant ion incorporation onto the divalent
ion site.
IT **123998-55-0**, Barium cerium neodymium zirconium oxide
BaCe0.8Nd0.1Zr0.1O3 **235098-96-1**, Barium cerium neodymium
zirconium oxide BaCe0.7Nd0.1Zr0.2O3 **235098-98-3**, Barium
cerium gadolinium zirconium oxide BaCe0.8Gd0.1Zr0.1O3
235099-00-0, Barium cerium gadolinium zirconium oxide
BaCe0.7Gd0.1Zr0.2O3
RL: PRP (Properties)
(nonstoichiometry, grain boundary transport and chemical stability

of **proton conducting** perovskites)
RN 123998-55-0 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 76
ST **fuel cell electrolyte proton conducting** perovskite; grain boundary transport **proton conducting** perovskite
IT Electric conductivity
Electrolytes
Fuel cell electrolytes
Grain boundaries
Nonstoichiometry
Perovskite-type crystals
(nonstoichiometry, grain boundary transport and chemical stability of **proton conducting** perovskites)

IT 12009-21-1, barium zirconium oxide bazro3 12036-39-4, strontium zirconium oxide srzro3 12267-77-5, barium cerium oxide baceo3 12267-97-9, cerium strontium oxide cesro3 112235-03-7, Barium cerium neodymium oxide BaCe0.9Nd0.1O3 **123998-55-0**, Barium cerium neodymium zirconium oxide BaCe0.8Nd0.1Zr0.1O3 136575-37-6, Barium cerium ytterbium oxide BaCe0.9Yb0.1O3 136575-38-7, Barium cerium gadolinium oxide BaCe0.9Gd0.1O3 **235098-96-1**, Barium cerium neodymium zirconium oxide BaCe0.7Nd0.1Zr0.2O3 **235098-98-3**, Barium cerium gadolinium zirconium oxide BaCe0.8Gd0.1Zr0.1O3 **235099-00-0**, Barium cerium gadolinium zirconium oxide BaCe0.7Gd0.1Zr0.2O3 347886-57-1, Barium cerium ytterbium zirconium oxide (BaCe0.8Yb0.1Zr0.1O3) 347886-58-2, Barium cerium ytterbium zirconium oxide (BaCe0.7Yb0.1Zr0.2O3)
RL: PRP (Properties)
(nonstoichiometry, grain boundary transport and chemical stability of **proton conducting** perovskites)

L379 ANSWER 74 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:200192 Microporous oxides as **electrolytes** in proton exchange membrane **fuel cells.** Anderson, Marc A.; Tejedor, M. Isabel (Water Chemistry Program, University of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 221st ACS National Meeting, San Diego, CA, United States, April 1-5, 2001 ENVR-137 (English) 2001. CODEN: 69FZD4. Publisher: American Chemical Society.

AB We have been investigating the phys. and electrochem. characteristics of inorg. membrane materials composed of microporous SiO2, TiO2 and Al2O3. All of these materials have high **surface** areas and high porosity. The Al2O3 membranes materials can be described as having slit-like pores of width less than 20 angstroms. SiO2 and TiO2 membrane materials contain randomly packed spherical nanoparticles and pore size in the **mesoporous** region. Our calcns. indicate that for our oxide samples equilibrated under conditons of 81% relative humidity and at 25°C the number of water mols. contained as expressed in mmols/cm3 are 20, 26 and 25 for SiO2, TiO2 and Al2O3 resp. Measured **proton conductivities** of all three oxides increase with increasing relative humidity, SiO2 and TiO2 increasing over 3 orders of magnitude between RH values of 33% and 97%. We also find that, at 81% RH, conductivities generally increase with increasing **temperature** with SiO2 increasing lineraly but TiO2 and Al2O3 exponentially. Activation energies for our materials are 15.8 , 17.0 and 17.1 kJ.Mol-1 for SiO2,TiO2, and Al2O3 resp. While our best values for the conductivities of our inorg. electrolytes are still about a factor of two less than an organic polymer membrane such as Nafion (5 x10-3 cm-1 vs at 80°C vs. 1.3 x 10-2 cm-1 at 79°C), it should be noted that we are comparing absolute values for the conductivity In practice, these ceramic membranes would be cast unto porous conducting **supports** with thicknesses less than 0.5 μ. Nafion membranes are typically around 200mm thick. This means that we should be capable of greatly reducing the actual resistance of these membrane electrolytes, and this, along with higher possible operating **temps.** should prove to make these systems com. competitive.

L379 ANSWER 75 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:20006 Document No. 134:165585 Complex impedance studies of **proton-conducting** membranes. Edmondson, C. A.; Stallworth, P. E.; Chapman, M. E.; Fontanella, J. J.; Wintersgill, M. C.; Chung, S. H.; Greenbaum, S. G. (Physics Department, U.S. Naval Academy, Annapolis, MD, 21402-5026, USA). Solid State Ionics, 135(1-4), 419-423 (English) 2000. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Complex impedance studies have been carried out on Dow 800, Dow 1000 and Nafion 117 membranes at various water contents and a variety of **temps.** and hydrostatic pressures. At room **temperature**

and pressure the usual gradual decrease in elec. conductivity with decreasing water content is observed For very low water content materials the variation of the conductivity with pressure from 0 to 0.2 GPa (2 kbar) is large and gives rise to apparent activation vols., ΔV, as large as 54 cm3/mol. In addition, for low water content materials, there is a tendency for smaller equivalent **wts.** (same **side** chains) or larger **side** chains to have larger activation vols. At high water content, ΔV is relatively independent of the host polymer and neg. values are observed at the highest water contents. These results provide **support** for the model where proton transport in high water content sulfonated fluorocarbons is similar to that for liquid water. All results are explained qual. via free volume Ambient-pressure, variable-**temperature** 2HT1 and linewidth measurements imply a heterogeneous environment of the water mols. Proton pulsed field gradient NMR studies in saturated Dow membranes verify the expectation that ionic conductivity is determined primarily by diffusion of water mols.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 36

ST fuel cell **proton conducting** membrane impedance

IT Electric conductivity
Fuel cell electrolytes
Fuel cells
Membranes, nonbiological
(complex impedance studies of **proton-conducting** membranes)

IT Polyoxyalkylenes, properties
RL: PRP (Properties)
(fluorine- and sulfo-containing, ionomers; complex impedance studies of **proton-conducting** membranes)

IT Fluoropolymers, properties
RL: PRP (Properties)
(polyoxyalkylene-, sulfo-containing, ionomers; complex impedance studies of **proton-conducting** membranes)

IT Ionomers
RL: PRP (Properties)
(polyoxyalkylenes, fluorine- and sulfo-containing; complex impedance studies of **proton-conducting** membranes)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(sulfonated; complex impedance studies of **proton-conducting** membranes)

IT 66796-30-3, Nafion 117 163515-65-9, Dow 800 324749-88-4, Dow 1000
RL: PRP (Properties)
(complex impedance studies of **proton-conducting** membranes)

L379 ANSWER 76 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2000:773924 Document No. 133:337259 Two-phase perovskite ionic and electric **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing. Wachsman, Eric D.; Jiang, Naixiong (Her Majesty In Right of Canada as Represented by the Minister of Natural Resources, Can.). Eur. Pat. Appl. EP 1048614 A1 20001102, 11 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-303635 20000428. PRIORITY: US 1999-302786 19990430.

AB A two-phase ionic **conductor** which exhibits both hydrogen ion conductivity and elec. conductivity consists of (1) a perovskite-type oxide of general formula ABO3, in which A is an element selected from Ba, Ca, Mg, and Sr, B is Ce1-xMx or Zr1-xMx (M is a selected from Y, Yb, In, Gd, Nd, Eu, Sm, and Tb), and x = 0-1; and (2) an elec. **conductor** comprising palladium. The palladium may be coated on particles of the oxide in the form of an oxide powder. These ionic **conductors** can act as ionic membranes for H2 sepns.

in reforming of light hydrocarbons to synthesis gas and for H2 manufacture from natural gas or C>1-hydrocarbons.

IT **7440-05-3**, Palladium, uses
RL: NUU (Other use, unclassified); USES (Uses)
(perovskite membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IT **131960-38-8P**, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) **304016-28-2P**, Strontium yttrium zirconium oxide (SrY0.04Zr0.96O3)
RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(perovskite, membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

RN 131960-38-8 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

RN 304016-28-2 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY0.04Zr0.96O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.96	7440-67-7
Y	0.04	7440-65-5
Sr	1	7440-24-6

IC ICM C01B003-50
ICS B01D053-22; B01D071-02; C01G025-00; C01F017-00; H01M008-06

CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 51, 52, 57

ST perovskite **ionic** elec cond membrane; hydrogen permeation perovskite membrane; palladium perovskite hydrogen sepn membrane; natural gas hydrogen sepn membrane; synthesis gas hydrogen sepn membrane; **fuel cell** hydrogen sepn membrane

IT Perovskite-type crystals
(membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

IT **Fuel cells**
(membranes, hydrogen manufacture with; two-phase perovskite **ionic** and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

IT Electric **conductors**
(perovskite membranes; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen

recovery from synthesis gas and hydrocarbon processing)
IT Natural gas, reactions
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(processing, hydrogen manufacture from; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT Ionic **conductors**
(**proton**, perovskite membranes; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT Synthesis gas manufacturing
(reforming synthesis gas manufacturing, hydrogen manufacture by; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT **7440-05-3**, Palladium, uses
RL: NUU (Other use, unclassified); USES (Uses)
(perovskite membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT 110687-91-7P, Cerium strontium ytterbium oxide (Ce0.95SrYb0.05O3) 112235-02-6P, Barium cerium neodymium oxide (BaCe0.95Nd0.05O3) 112235-03-7P, Barium cerium neodymium oxide (BaCe0.9Nd0.1O3) 113876-58-7P, Barium cerium yttrium oxide (BaCe0.90Y0.10O3) **131960-38-8P**, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) 136575-37-6P, Barium cerium ytterbium oxide (BaCe0.9Yb0.1O3) 136575-39-8P, Barium cerium yttrium oxide (BaCe0.95Y0.05O3) 137806-35-0P, Calcium indium zirconium oxide (CaIn0.04Zr0.96O3) 140883-59-6P, Strontium ytterbium zirconium oxide (SrYb0.05Zr0.95O3) 142107-79-7P, Calcium indium zirconium oxide (CaIn0.1Zr0.9O3) 143312-53-2P, Barium cerium yttrium oxide (BaCe0.8Y0.2O3) 144049-10-5P, Barium cerium gadolinium oxide (BaCe0.85Gd0.15O3) 144378-46-1P, Barium cerium gadolinium oxide (BaCe0.8Gd0.2O3) 148972-97-8P, Barium cerium samarium oxide (BaCe0.8Sm0.2O3) 150232-28-3P, Barium yttrium zirconium oxide (BaY0.05Zr0.95O3) 150232-31-8P, Calcium indium zirconium oxide (CaIn0.05Zr0.95O3) 184022-90-0P, Barium cerium europium oxide (BaCe0.85Eu0.15O3) 304016-22-6P, Barium cerium terbium oxide (BaCe0.85Tb0.15O3) **304016-28-2P**, Strontium yttrium zirconium oxide (SrY0.04Zr0.96O3)
RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(perovskite, membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT 1333-74-0P, Hydrogen, preparation
RL: IMF (Industrial manufacture); PREP (Preparation)
(recovery of; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
IT 74-82-8, Methane, reactions
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(reforming of; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

L379 ANSWER 77 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:721148 Document No. 133:364386 Polymer solid acid composite membranes for **fuel-cell** applications. Boysen, Dane A.; Chisholm, Calum R. I.; Haile, Sossina M.; Narayanan, Sekharipuram R. (Department of Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Journal of the Electrochemical Society, 147(10), 3610-3613 (English) 2000. CODEN:

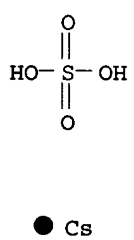
JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.

AB A systematic study of the conductivity of polyvinylidene fluoride (PVDF) and CsHSO4 composites, containing 0 to 100% CsHSO4, has been carried out. The polymer, with its good mech. properties, served as a **supporting** matrix for the high **proton cond**. inorg. phase. The conductivity of composites exhibited a sharp increase with **temperature** at 142°C, characteristic of the superprotonic phase transition of CsHSO4. At high **temperature** (160°C), the dependence of conductivity on vol % CsHSO4 was monotonic and revealed a percolation threshold of .apprx.10 volume%. At low **temperature** (100°C), a maximum in the conductivity at .apprx.80 vol % CsHSO4 was observed Results of preliminary **fuel cell** measurements are presented.

IT **7789-16-4**, Cesium hydrogen sulfate
RL: DEV (Device component use); USES (Uses)
(polymer solid acid composite membranes for **fuel-cell** applications)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 72, 76

ST polyvinylidene fluoride cesium hydrogen sulfate **electrolyte**; **fuel cell** solid **electrolyte**

IT **Fuel cell electrolytes**
Ionic conductivity
Structural phase transition
(polymer solid acid composite membranes for **fuel-cell** applications)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polymer solid acid composite membranes for **fuel-cell** applications)

IT **7789-16-4**, Cesium hydrogen sulfate 24937-79-9, Polyvinylidene fluoride
RL: DEV (Device component use); USES (Uses)
(polymer solid acid composite membranes for **fuel-cell** applications)

L379 ANSWER 78 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

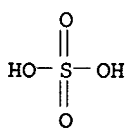
2000:535394 Document No. 133:137861 **Proton conducting** membrane using a solid acid for **fuel cells**. Haile, Sossina M.; Boysen, Dane; Narayanan, Sekharipuram R.; Chisholm, Calum (California Institute of Technology, USA). PCT Int. Appl. WO 2000045447 A2 20000803, 61 pp. DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US1783 20000121. PRIORITY: US 1999-PV116741

19990122; US 1999-PV146946 19990802; US 1999-PV146943 19990802; US 1999-PV151811 19990830; US 1999-439377 19991115.

AB A solid acid material is used as a **proton conducting** membrane in an electrochem. device. The solid acid material can be one of a plurality of different kinds of materials. A binder can be added, and that binder can be either a nonconducting or a conducting binder. Nonconducting binders can be, for example, a polymer or a glass. A conducting binder enables the device to be both **proton conducting** and electron conducting.

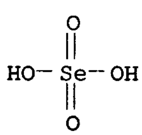
IT **7789-16-4**, Cesium hydrogen sulfate cshso4 **10294-60-7**, Ammonium hydrogen selenate **18649-05-3**, Cesium dihydrogen phosphate **63317-98-6 89190-25-0 161882-09-3 286382-81-8**
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**proton conducting** membrane using solid acid for **fuel cells**)

RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



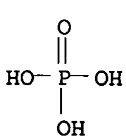
● Cs

RN 10294-60-7 HCAPLUS
CN Selenic acid, monoammonium salt (9CI) (CA INDEX NAME)



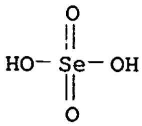
● NH_3

RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



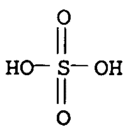
● Cs

RN 63317-98-6 HCAPLUS
CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)



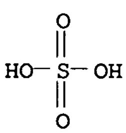
●3/2 NH_3

RN 89190-25-0 HCAPLUS
CN Sulfuric acid, cesium salt (2:3) (9CI) (CA INDEX NAME)



●3/2 Cs

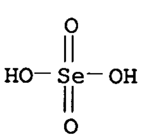
RN 161882-09-3 HCAPLUS
CN Sulfuric acid, cesium salt (4:5), hydrate (9CI) (CA INDEX NAME)



●5/4 Cs

●x H_2O

RN 286382-81-8 HCAPLUS
CN Selenic acid, ammonium salt (4:5), hydrate (9CI) (CA INDEX NAME)



●5/4 NH_3

●x H_2O

ICI H01
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 76
ST **fuel cell proton conducting**
membrane solid acid
IT Conducting polymers
Electric **conductors**
Electric insulators
Semiconductor materials
(binder; **proton conducting** membrane using
solid acid for **fuel cells**)
IT Fluoropolymers, uses
Glass, uses
Metals, uses
Polyesters, uses
Polymers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(binder; **proton conducting** membrane using
solid acid for **fuel cells**)
IT Sintering
(hot pressing; **proton conducting** membrane
using solid acid for **fuel cells**)
IT Polyketones
Polyketones
RL: TEM (Technical or engineered material use); USES (Uses)
(polyether-; **proton conducting** membrane using
solid acid for **fuel cells**)
IT Polyethers, uses
Polyethers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyketone-; **proton conducting** membrane
using solid acid for **fuel cells**)
IT Battery **electrolytes**
Ceramics
Electrolytic cells
Fuel cell electrolytes
Fuel cells
(**proton conducting** membrane using solid acid
for **fuel cells**)
IT Fluoropolymers, uses
Phosphates, uses
Polyanilines
Polysiloxanes, uses
Selenates
Silicates, uses
Sulfates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conducting** membrane using solid acid
for **fuel cells**)
IT Capacitors
(supercapacitor; **proton conducting** membrane
using solid acid for **fuel cells**)
IT 7440-21-3, Silicon, uses 24937-79-9, Pvdf
RL: TEM (Technical or engineered material use); USES (Uses)
(binder; **proton conducting** membrane using
solid acid for **fuel cells**)
IT 7782-42-5, Graphite, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(paper; **proton conducting** membrane using
solid acid for **fuel cells**)
IT 7722-76-1, Ammonium dihydrogen phosphate **7789-16-4**, Cesium
hydrogen sulfate cshso4 7803-63-6, Ammonium hydrogen sulfate
10294-60-7, Ammonium hydrogen selenate 12593-60-1,
Ammonium phosphate sulfate ((NH4)2(H2PO4)(HSO4)) 13453-45-7,
Thallium hydrogen sulfate tlhso4 13774-16-8, Rubidium dihydrogen

phosphate 13775-30-9 13778-50-2, Sodium silicate Na3HSiO4
13780-02-4 15457-97-3, Sodium silicate (Na2H2SiO4) 15587-72-1,
Rubidium hydrogen sulfate 16331-85-4 **18649-05-3**, Cesium
dihydrogen phosphate 20583-58-8, Sulfuric acid, rubidium
salt (2:3) 22112-04-5 39473-99-9, Rubidium phosphate
selenate (Rb2(H2PO4)(HSeO4)) 41469-37-8, Sodium silicate NaH3SiO4
63317-98-6 63737-07-5, Cesium hydrogen selenate cshseo4
68875-27-4, Rubidium hydrogen selenate 71555-62-9 88937-51-3
89190-25-0 99489-71-1, Ammonium arsenate sulfate
((NH4)2(H2AsO4)(HSO4)) 99543-07-4, Selenic acid, cesium
salt (2:3) 101811-97-6, Potassium silicate KH3SiO4
135498-03-2 135710-63-3 157612-88-9 161430-99-5, Tellurium
oxide teo4 **161882-09-3** 165901-90-6, Cesium phosphate
sulfate (Cs3(H2PO4)(HSO4)2) 183953-14-2, Silicic acid (H4SiO4),
tripotassium **salt** 183953-17-5, Silicic acid (H4SiO4),
dipotassium **salt** 213411-40-6, Cesium phosphate sulfate
(Cs3(H2PO4)0.5(HSO4)2.5) 218931-29-4, Cesium phosphate sulfate
(Cs5(H2PO4)2(HSO4)3) 220078-67-1, Cesium phosphate selenate
(Cs3(H2PO4)(HSeO4)2) 220078-71-7, Cesium phosphate selenate
(Cs5(H2PO4)2(HSeO4)3) 231277-45-5, Cesium phosphate sulfate
(Cs2(H2PO4)(HSO4)) 233277-01-5, Ammonium phosphate selenate
((NH4)2(H2PO4)(HSeO4)) 260429-55-8, Rubidium phosphate sulfate
(Rb2(H2PO4)(HSO4)) 286382-74-9, Cesium phosphate selenate
(Cs2(H2PO4)(HSeO4)) 286382-75-0 286382-77-2 286382-78-3
286382-79-4, Cesium phosphate selenate (Cs3(H2PO4)0.5(HSeO4)2.5)
286382-81-8 286382-82-9 286382-83-0 286382-84-1
286382-85-2 286382-86-3 286382-87-4 286382-88-5 286382-89-6
286382-90-9
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(**proton conducting** membrane using solid acid
for **fuel cells**)

IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses 1344-28-1,
Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses
7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-50-8,
Copper, uses 7440-57-5, Gold, uses 7440-66-6, Zinc, uses
7631-86-9, Silica, uses 9002-84-0, Ptfe 25038-78-2,
Poly(dicyclopentadiene) 25233-30-1, Polyaniline 25667-42-9
30604-81-0, Polypyrrole 31900-57-9, Polydimethyl siloxane
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conducting** membrane using solid acid
for **fuel cells**)

IT 1333-74-0P, Hydrogen, preparation
RL: PUR (Purification or recovery); PREP (Preparation)
(separator; **proton conducting** membrane using
solid acid for **fuel cells**)

L379 ANSWER 79 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:143468 Document No. 132:168778 Substrate **supported**
catalyst layers for polymer **electrolyte fuel
cell** electrodes, inks and method for manufacture the
catalyst layer, gas diffusion electrodes, catalyst membrane
assembly, and electrode membrane assembly. Zuber, Ralf; Kalhi,
Ralf; Knut, Fehl; Starz, Karl-Anton (Degussa-Huls A.-G., Germany).
Jpn. Kokai Tokkyo Koho JP 2000067873 A2 20000303, 9 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 1999-232591 19990819. PRIORITY: DE
1998-19837669 19980820.

AB The catalyst layers contain a **H+ conductive**
ionomer and noble **metal** laded conductive carbonaceous
particles, and are prepared from an ink containing the ionomer, the
carbonaceous particles, and a 0 valence noble **metal**
complex by applying the ink on a substrate and decomposing the complex
at a **temperature** that does cause damage to the substrate. The
gas diffusion electrodes have the catalyst layer on a gas diffusing
substrate, the catalyst membrane assembly has the catalyst layer on
both **side** of a polymer electrolyte membrane, and the

electrode membrane assembly has gas diffusion structures on both **sides** of the catalyst membrane assembly.
IC ICM H01M004-86
ICS H01M004-88; H01M004-90; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST polymer **electrolyte fuel cell**
electrode catalyst
IT Carbon black, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**; electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine-containing, sulfo-containing, **ionomers**; electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT **Fuel cell** electrodes
(in manufacture of electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**; electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT **Ionomers**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)
IT 2627-95-4DP, 1,3-Divinyl-1,1,3,3-tetramethyldisiloxane, reaction products with platinum 48018-87-7DP, reaction products with 1,3-divinyl-1,1,3,3-tetramethyl disiloxane
RL: IMF (Industrial manufacture); NUU (Other use, unclassified); PREP (Preparation); USES (Uses)
(in manufacture of electrode catalyst layers containing noble **metal** laden carbonaceous materials and **ionomers** for polymer **electrolyte fuel cells**)

L379 ANSWER 80 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:116981 Document No. 132:174949 Inorganic hydrogen and hydrogen polymer compounds and applications thereof. Mills, Randell L. (USA). PCT Int. Appl. WO 2000007931 A2 20000217, 385 pp.
DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,

CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US17129 19990729. PRIORITY: US 1998-95149 19980803; US 1998-101651 19980924; US 1998-105752 19981026; US 1998-113713 19981224; US 1999-123835 19990311; US 1999-130491 19990422; US 1999-141036 19990629.

AB Compds. are provided comprising at least one neutral, pos., or neg. hydrogen species having a binding energy greater than its corresponding ordinary hydrogen species, or greater than any hydrogen species for which the corresponding ordinary hydrogen species is unstable or is not observed Compds. comprise at least one increased binding energy hydrogen species and at least one other atom, mol., or **ion** other than an increased binding energy hydrogen species. One group of such compds. contains one or more increased binding energy hydrogen species selected from the group consisting of Hn, Hn-, and Hn-, where n is a pos. integer, with the proviso that n > 1 when H has a pos. charge. Another group of such compds. may have the formula [MHmM'X]n wherein m and n are each an integer, M and M' are each an alkali or alkaline earth **cation**, X is a singly or doubly neg. charged **anion**, and the hydrogen content Hm of the compound comprises at least one increased binding energy hydrogen species. Methods of forming the compds. and numerous applications are disclosed. A method for forming the compds. comprises reacting gaseous hydrogen atoms with a gaseous **metal** catalyst (list of **metals** provided) and reaction of the formed hydrino atoms with at least one selected from the group of a source of electrons (H+, increased binding energy hydrogen species, other element). A method for extracting energy from H atoms further comprises the step of applying an adjustable elec. or magnetic field to control the rate of energy release. Thus, potassium iodo **hydride** (KHI) comprising high binding energy **hydride ions** (hydrino **hydrides**) are prepared by reaction of atomic hydrogen with potassium iodide in the presence of potassium **metal** catalyst in a stainless steel gas cell (apparatus diagrams provided). The blue crystals were characterized by a number of methods (ToF-SIMS, XPS, 1H and 39K MAS NMR, FTIR, Electrospray-**Ionization**-Time-of-Flight Mass Spectroscopy, LC/MS, elemental anal., thermal decomposition). The compound contains two forms of **hydride ion**; thermal decomposition with mass spectral anal. indicates at least H-(1/2) is present in KHI which may be responsible for the blue color. The objective of the invention is to provide compds. that can be used in a wide variety of applications, e.g., batteries, **fuel cells**, cutting materials, light-weight high-strength materials and synthetic fibers, corrosion or heat-resistant **coatings**, xerog. compds., proton source, photoluminescent compds., phosphors for lighting, UV and visible light source, photoconductors, photovoltaics, chemiluminescent or fluorescent compds., optical **coatings** or filters, extreme UV laser media, fiber optic cables, magnets and magnetic computer storage media, superconductors, etching agents, masking agents, agents to purify silicon, dopants in semiconductor fabrication, cathodes for thermoionic generators, fuels, explosives, and propellants. Claimed uses of the present invention include separation of isotopes, a proton source, xerog. toner, use in a magnet or magnetic computer memory storage material, or as an etching agent. Time-of-flight secondary **ion** mass spectral data (ToF-SIMS) are listed for a wide variety of hydrino **hydride** compds. or their fragments.

IT **7439-89-6, Iron**, uses **7440-02-0, Nickel**, uses **7440-05-3, Palladium**, uses **7440-32-6, Titanium**, uses **7440-47-3**,

Chromium, uses **7440-50-8**, **Copper**, uses
7440-62-2, **Vanadium**, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst for preparation of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM C01B006-00
CC 78-5 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 50, 52, 67, 71, 76, 79
ST hydrino **hydride** inorg compd prepn; hydrogen hydrino polymer inorg compd prepn; alkali **metal** hydrino **hydride** prepn; **metal** catalyst hydrino **hydride** prepn; binding energy hydrino **hydride**; etching agent hydrino **hydride** compd; isotope sepn hydrino **hydride** compd; magnet memory storage hydrino **hydride** compd
IT Catalysts
(gaseous **metals** as catalysts in preparation of

hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
IT Transition **metals**, uses
RL: CAT (Catalyst use); USES (Uses)
(gaseous transition **metals** as catalysts for preparation of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
IT Alkaline earth compounds
RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
(**hydrides**; preparation and uses of hydrino-containing alkaline earth **hydrides**)
IT Alkali **metal hydrides**
RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
(preparation and uses of hydrino-containing alkali **metal hydrides**)
IT **Hydrides**
RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
(preparation and uses of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
IT Transition **metal hydrides**
RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
(preparation and uses of **metal** hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
IT 7429-91-6, Dysprosium, uses **7439-89-6, Iron**, uses 7439-90-9, Krypton, uses 7439-92-1, Lead, uses 7439-93-2, Lithium, uses 7439-96-5, Manganese, uses 7439-98-7, Molybdenum, uses **7440-02-0, Nickel**, uses 7440-03-1, Niobium, uses **7440-05-3, Palladium**, uses 7440-06-4, Platinum, uses 7440-10-0, Praseodymium, uses 7440-17-7, Rubidium, uses 7440-19-9, Samarium, uses 7440-24-6, Strontium, uses 7440-31-5, Tin, uses **7440-32-6, Titanium**, uses 7440-38-2, Arsenic, uses 7440-41-7, Beryllium, uses 7440-45-1, Cerium, uses 7440-46-2, Cesium, uses **7440-47-3, Chromium**, uses 7440-48-4, Cobalt, uses **7440-50-8, Copper**, uses 7440-54-2, Gadolinium, uses **7440-62-2, Vanadium**, uses 7440-66-6, Zinc, uses 7440-70-2, Calcium, uses 7782-49-2, Selenium, uses 13494-80-9, Tellurium, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst for preparation of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
IT 7440-09-7, Potassium, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst for preparation of inorg. **hydrides** and hydrogen polymer compds. containing hydrino **hydrides**)
IT 7681-11-0, Potassium iodide, reactions 12385-13-6, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(for preparation of inorg. **hydrides** and hydrogen polymer compds. containing hydrino **hydrides**)
IT 50808-20-3DP, Silicon **hydride**, inorg. hydrino-containing compound with hydrogen polymer 169217-93-0DP, Hydrogen, mol. (H16), inorg. hydrino-containing compound, preparation 169217-94-1DP, Hydrogen, mol. (H24), inorg. hydrino-containing compound, preparation 179466-41-2DP, Hydrogen, mol. (H10), inorg. hydrino-containing compound, preparation 258858-25-2P, Potassium carbonate **hydride** hydroxide 258880-05-6DP, Hydrogen, ion (H161-), inorg.

hydrino-containing compound, preparation 258880-32-9DP, Hydrogen, mol. (H60), inorg. hydrino-containing compound, preparation 258880-33-0DP, Hydrogen, mol. (H70), inorg. hydrino-containing compound, preparation
RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
(preparation and uses of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)

IT 258858-22-9P, Potassium carbonate **hydride** 258858-23-0P, Potassium **hydride** nitrate (K2H(NO3)) 258858-24-1P, Potassium **hydride** hydroxide (K2H(OH))
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of inorg. **hydride** compound containing hydrino **hydrides**)

IT 258851-61-5P, Potassium **hydride** iodide (KHI)
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation of inorg. **hydride** containing hydrino **hydrides**, thermal decomposition, air oxidation/hydrolysis, and characterization by multiple methods)

IT 258858-21-8P, Potassium carbonate **hydride** (K2(HCO3)H)
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of inorg. **hydride**/hydrogen compound containing hydrino **hydrides**)

L379 ANSWER 81 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:91550 Document No. 132:254691 Fabrication and properties of thin ceramic films deposited on porous substrates. Jacobson, Craig P.; Visco, Steven J.; De Jonghe, Lutgard C. (Lawrence Berkeley National Laboratory, University of California, Berkeley, CA, 94720, USA). Ceramic Transactions, 85(Innovative Processing and Synthesis of Ceramics, Glasses, and Composites), 323-332 (English) 1997. CODEN: CETREW. ISSN: 1042-1122. Publisher: American Ceramic Society.

AB Bilayers consisting of highly porous substrates and dense thin-films of zirconia, ceria, and perovskite mixed **conductors** (SrZrO3, SrCeO3, and LaSrCoFeO3) have been successfully fabricated using colloidal deposition techniques. The films are well bonded to the substrate, gas tight, and exhibit little interfacial resistance. Performance of solid oxide **fuel cells** (**SOFCs**) based on YSZ **electrolytes** of less than 10 µm have achieved power densities close to 2 W/cm2 at 800°C. Ceria based **SOFCs** exhibited excellent electrochem. performance over the **temperature** range of 600 to 800°C with peak power in excess of 650 mW/cm2 at 750°C and close to 300 mW/cm2 at 600°C. In addition bilayers of thin SrCeO3 and La0.8Sr0.2Co0.8Fe0.2O3 (LSCF) suitable for gas separation or membrane reactors have been fabricated and **fuel cells** based on **proton conducting** SrZrO3 films have also been fabricated and tested. The approach is generic and allows deposition of a variety of thin ceramic films on porous substrates. The methodol. is scaleable and inexpensive, and should allow substantial cost-savings in the manufacture and operation of electrochem. devices in the intermediate **temperature** range of 500-800°C.

IT **131960-38-8**, Strontium yttrium zirconium oxide SrY0.05Zr0.95O3
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(films, electrochem. cells; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)

RN 131960-38-8 HCAPLUS
CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component

		Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 57-2 (Ceramics)
Section cross-reference(s): 52
ST oxide film colloidal deposition property porous substrate; **fuel cell** oxide film colloidal deposition property porous substrate
IT **Fuel cells**
(solid oxide; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)
IT 118392-69-1, Cobalt lanthanum nickel strontium oxide Co0.98La0.6Ni0.02Sr0.4O3 120605-82-5, Lanthanum manganese strontium oxide La0.85MnSr0.15O3
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(cathode, **fuel cell**; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)
IT 1306-38-3, Cerium oxide (CeO2), properties 1314-23-4, Zirconium oxide (ZrO2), properties 12036-39-4, Strontium zirconium oxide (SrZrO3) 12267-97-9, Cerate (CeO32-), strontium (1:1) 64417-98-7, Yttrium zirconium oxide 114902-12-4, Cobalt iron lanthanum strontium oxide Co0.8Fe0.2La0.8Sr0.2O3 **131960-38-8**, Strontium yttrium zirconium oxide SrY0.05Zr0.95O3 206191-10-8, Cerium gadolinium oxide (Ce0.8Gd0.2O1.8)
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(films, electrochem. cells; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)

L379 ANSWER 82 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1999:737354 Document No. 132:17567 Chemical stability and **proton conductivity** of doped BaCeO3-BaZrO3 solid solutions. Ryu, Kwang Hyun; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Solid State Ionics, 125(1-4), 355-367 (English) 1999. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
AB Barium cerate has a high **proton conductivity** but rather poor chemical stability in CO2-containing atms. Barium zirconate, in contrast, is a rather stable material but one that exhibits low **proton conductivity** The conductivity and chemical stability of solid solns. between these compds. were studied, in an attempt to find a composition exhibiting both high conductivity and good stability. Compds. BaCe0.9-xZrxM0.1O3-δ, where M was Gd or Nd and x ranged from 0 to 0.4, were prepared by solid state reaction and characterized by x-ray powder diffraction, TGA in flowing CO2, DTA in flowing CO2, and a.c. impedance spectroscopy in dry and H2O-saturated argon. Introduction of Zr into doped barium cerate greatly enhanced the chemical stability: for the Nd-doped system, compns. with x = 0.2 or higher did not react with CO2 (under the exptl., nonequil. conditions), whereas for the Gd-doped system, the composition with x = 0.4 did not react. Not unexpectedly, introduction of Zr also decreased conductivity and an increase in the activation energy for proton transport. Overall, Nd-doped samples exhibited higher chemical stability and lower conductivity than those doped with Gd. The composition BaCe0.7Zr0.2Nd0.1O3-δ appears to give a good compromise between conductivity and stability for **fuel cell** applications.
IT **123998-55-0D**, Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3), oxygen-deficient **235098-96-1D**, Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3), oxygen-deficient **235098-98-3D**, Barium cerium gadolinium

zirconium oxide (BaCe0.8Gd0.1Zr0.1O3), oxygen-deficient **235099-00-0D**, Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3), oxygen-deficient **235099-02-2D**, Barium cerium neodymium zirconium oxide (BaCe0.6Nd0.1Zr0.3O3), oxygen-deficient **251566-53-7D**, Barium cerium neodymium zirconium oxide (BaCe0.5Nd0.1Zr0.4O3), oxygen-deficient **251566-55-9D**, Barium cerium gadolinium zirconium oxide (BaCe0.6Gd0.1Zr0.3O3), oxygen-deficient **251566-57-1D**, Barium cerium gadolinium zirconium oxide (BaCe0.5Gd0.1Zr0.4O3), oxygen-deficient
RL: PRP (Properties)
(chemical stability and **proton conductivity** of doped BaCeO3-BaZrO3 solid solns.)

RN 123998-55-0 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS

CN Barium cerium neodymium zirconium oxide ($BaCe0.6Nd0.1Zr0.3O3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-53-7 HCAPLUS
CN Barium cerium neodymium zirconium oxide ($BaCe0.5Nd0.1Zr0.4O3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.5	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-55-9 HCAPLUS
CN Barium cerium gadolinium zirconium oxide ($BaCe0.6Gd0.1Zr0.3O3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.3	7440-67-7
Gd	0.1	7440-54-2
Ce	0.6	7440-45-1
Ba	1	7440-39-3

RN 251566-57-1 HCAPLUS
CN Barium cerium gadolinium zirconium oxide ($BaCe0.5Gd0.1Zr0.4O3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.1	7440-54-2
Ce	0.5	7440-45-1
Ba	1	7440-39-3

CC 76-2 (Electric Phenomena)
ST barium cerium zirconium oxide **proton cond**
stability
IT Electric impedance
Ionic **conductors**
Stability
X-ray diffraction
(chemical stability and **proton conductivity** of doped
BaCeO3-BaZrO3 solid solns.)
IT Ionic **conductivity**
(**proton**; chemical stability and **proton**
conductivity of doped BaCeO3-BaZrO3 solid solns.)
IT 12009-21-1, Barium zirconate (BaZrO3) 12267-77-5, Barium cerium
oxide (BaCeO3) 112235-03-7D, Barium cerium neodymium oxide
(BaCe0.9Nd0.1O3), oxygen-deficient **123998-55-0D**, Barium

cerium neodymium zirconium oxide ($BaCe_{0.8}Nd_{0.1}Zr_{0.1}O_3$), oxygen-deficient 136575-38-7D, Barium cerium gadolinium oxide ($BaCe_{0.9}Gd_{0.1}O_3$), oxygen-deficient **235098-96-1D**, Barium cerium neodymium zirconium oxide ($BaCe_{0.7}Nd_{0.1}Zr_{0.2}O_3$), oxygen-deficient **235098-98-3D**, Barium cerium gadolinium zirconium oxide ($BaCe_{0.8}Gd_{0.1}Zr_{0.1}O_3$), oxygen-deficient **235099-00-0D**, Barium cerium gadolinium zirconium oxide ($BaCe_{0.7}Gd_{0.1}Zr_{0.2}O_3$), oxygen-deficient **235099-02-2D**, Barium cerium neodymium zirconium oxide ($BaCe_{0.6}Nd_{0.1}Zr_{0.3}O_3$), oxygen-deficient **251566-53-7D**, Barium cerium neodymium zirconium oxide ($BaCe_{0.5}Nd_{0.1}Zr_{0.4}O_3$), oxygen-deficient **251566-55-9D**, Barium cerium gadolinium zirconium oxide ($BaCe_{0.6}Gd_{0.1}Zr_{0.3}O_3$), oxygen-deficient **251566-57-1D**, Barium cerium gadolinium zirconium oxide ($BaCe_{0.5}Gd_{0.1}Zr_{0.4}O_3$), oxygen-deficient
RL: PRP (Properties)
(chemical stability and **proton conductivity** of doped $BaCeO_3$-$BaZrO_3$ solid solns.)

L379 ANSWER 83 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1999:737346 Document No. 131:339430 Aspects of the formation and mobility of protonic charge carriers and the stability of perovskite-type oxides. Kreuer, K. D. (Max-Planck-Institut fur Festkorperforschung, Stuttgart, D-70569, Germany). Solid State Ionics, 125(1-4), 285-302 (English) 1999. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB **Proton conducting** acceptor-doped perovskite-type alkaline earth cerates, zirconates, niobates and titanates have been investigated exptl. and by numerical simulations. For all cubic perovskites the concentration of protonic defects almost reaches the acceptor dopant concentration under appropriate conditions, and the mobility of protonic defects fall into a narrow range. Any symmetry reduction, however, leads to a reduction of the concentration and mobility of protonic defects. For all oxides, dynamical hydrogen bonding is suggested to lead to a local lattice softening, which provides an advantageous environment for high proton-mobility. This effect may explain the very high **proton conductivity** in covalent acceptor-doped $BaZrO_3$, which has been found exptl. for the first time. Since this oxide also shows good thermodn. phase stability, it is an interesting candidate as separator material in high-drain electrochem. applications such as **fuel cells.**

IT **153328-13-3D**, Strontium yttrium zirconium oxide ($SrY_{0.1}Zr_{0.9}O_3$), oxygen-depleted **196817-19-3D**, Barium calcium niobium oxide ($BaCa_{0.39}Nb_{0.61}O_3$), oxygen-depleted
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(formation, mobility, and stability of perovskite-type oxides)

RN 153328-13-3 HCAPLUS
CN Strontium yttrium zirconium oxide ($SrY_{0.1}Zr_{0.9}O_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 196817-19-3 HCAPLUS
CN Barium calcium niobium oxide ($BaCa_{0.39}Nb_{0.61}O_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

O	3	17778-80-2
Ca	0.39	7440-70-2
Ba	1	7440-39-3
Nb	0.61	7440-03-1

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76
ST perovskite oxide **proton conductor** stability;
fuel cell perovskite separator stability
IT Activation energy
Electric **conductors**, ceramic
Electric impedance
Fuel cell separators
Helmholtz free energy
Hydration, chemical
Ionic **conductors**
Perovskite-type crystals
Stability
(formation, mobility, and stability of perovskite-type oxides)
IT 113876-58-7D, Barium cerium yttrium oxide (BaCe0.9Y0.1O3), oxygen-depleted 142487-25-0, Barium tin yttrium oxide (Ba2SnYO5.5) **153328-13-3D**, Strontium yttrium zirconium oxide (SrY0.1Zr0.9O3), oxygen-depleted 158919-45-0D, Cerium strontium yttrium oxide (Ce0.9SrY0.1O3), oxygen-depleted 160421-61-4D, Barium cerium yttrium oxide (BaCe0.98Y0.02O3), oxygen-depleted **196817-19-3D**, Barium calcium niobium oxide (BaCa0.39Nb0.61O3), oxygen-depleted 226087-55-4D, Scandium strontium titanium oxide (Sc0.05SrTi0.95O3), oxygen-depleted 249620-70-0D, Barium scandium titanium oxide (BaSc0.05Ti0.95O3), oxygen-depleted 249620-71-1D, Barium yttrium zirconium oxide (BaY0.1Zr0.9O3), oxygen-depleted
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(formation, mobility, and stability of perovskite-type oxides)

L379 ANSWER 84 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1999:415936 Document No. 131:146817 Influence of zirconium substitution on the chemical stability and conductivity of BaCeO3-based **proton conductors.** Ryu, Kwang Hyun; Haile, Sossina M. (Materials Science 138-78, California Institute of Technology, CA, 91125, USA). Proceedings - Electrochemical Society, 98-15(Selected Battery Topics), 485-494 (English) 1999. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
AB The impact of zirconium substitution on the conductivity and chemical stability of doped barium cerate has been investigated. Compds. of general formula BaCe0.9-xZrxM0.1O3-δ, where M was Gd or Nd and x ranged from 0 to 0.4, were characterized by thermal gravimetric anal. in flowing CO2, DTA in flowing CO2, and impedance spectroscopy in dry and H2O-saturated argon. Introduction of Zr into doped barium cerate greatly enhanced the chemical stability: for the Nd-doped system, compns. with x = 0.2 or higher did not react with CO2 (under the exptl., nonequil. conditions), whereas for the Gd-doped system, the composition with x = 0.4 did not react. Introduction of Zr also led to a decrease in conductivity and an increase in the activation energy for proton transport. Overall, Nd-doped samples exhibited higher chemical stability and lower conductivity than those doped with Gd. The composition BaCe0.7Zr0.2Nd0.1O3-δ, appears to give a good compromise between conductivity and stability for **fuel cell** applications.
IT **123998-55-0D**, Barium cerium neodymium zirconium oxide BaCe0.8Nd0.1Zr0.1O3, oxygen-deficient **235098-96-1D**, Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3), oxygen-deficient **235098-98-3D**, Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3), oxygen-deficient **235099-00-0D**, Barium cerium gadolinium zirconium oxide

(BaCe0.7Gd0.1Zr0.2O3), oxygen-deficient **235099-02-2D**,
Barium cerium neodymium zirconium oxide (BaCe0.6Nd0.1Zr0.3O3),
oxygen-deficient
RL: PRP (Properties)
(influence of zirconium substitution on chemical stability and conductivity
of BaCeO3-based **proton conductors**)

RN 123998-55-0 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS
CN Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.6Nd0.1Zr0.3O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2

Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
ST zirconium barium cerium oxide **proton conductor**; **fuel cell electrolyte proton conductor**
IT Electric conductivity
Fuel cell electrolytes
Ionic **conductors**
(influence of zirconium substitution on chemical stability and conductivity of BaCeO3-based **proton conductors**)
IT 112235-03-7D, Barium cerium neodymium oxide BaCe0.9Nd0.1O3, oxygen-deficient **123998-55-0D**, Barium cerium neodymium zirconium oxide BaCe0.8Nd0.1Zr0.1O3, oxygen-deficient 136575-38-7D, Barium cerium gadolinium oxide BaCe0.9Gd0.1O3, oxygen-deficient **235098-96-1D**, Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3), oxygen-deficient **235098-98-3D**, Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3), oxygen-deficient **235099-00-0D**, Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3), oxygen-deficient **235099-02-2D**, Barium cerium neodymium zirconium oxide (BaCe0.6Nd0.1Zr0.3O3), oxygen-deficient
RL: PRP (Properties)
(influence of zirconium substitution on chemical stability and conductivity of BaCeO3-based **proton conductors**)

L379 ANSWER 85 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1999:388624 Document No. 131:61182 Solid **electrolyte fuel cells** for gas leakage prevention. Miyashita, Tomofumi; Suwahara, Hisashi; Seike, Satoshi; Noguchi, Yoshitaka; Imasawa, Chieko (Meidensha Electric Mfg. Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11162483 A2 19990618 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-322562 19971125.
AB In the **fuel cells**, the solid **electrolyte** has a protective layer having conductivity to electron and **ion**, and the layer is formed on the H electrode (anode) **side**. Preferably, the protective layer comprises an oxide having an O-deficient perovskite-type crystal structure obtained by doping an oxide containing trivalent (+3) rare earth **metal** to perovskite having conductivity to O **ion**. The protective layer may contain Ni. Gas leakage caused by crack of the solid **electrolyte** is prevented by the protective layer.
IT **201597-70-8P**, Strontium yttrium zirconium oxide
RL: DEV (Device component use); MOA (Modifier or additive use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(**fuel cell** having O-deficient perovskite-type oxide as protective layer on anode **side** of solid **electrolyte** for gas leakage prevention)
RN 201597-70-8 HCAPLUS
CN Strontium yttrium zirconium oxide (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	x	17778-80-2
Zr	x	7440-67-7
Y	x	7440-65-5
Sr	x	7440-24-6

IC ICM H01M008-02
ICS H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 76
ST solid **electrolyte** protective layer **fuel cell**; perovskite oxide coating **electrolyte fuel cell**
IT Electric **conductors**
Ionic conductors
Perovskite-type crystals
Solid state **fuel cells**
(**fuel cell** having O-deficient perovskite-type oxide as protective layer on anode **side** of solid **electrolyte** for gas leakage prevention)
IT 1313-99-1, Nickel oxide (NiO), uses
RL: MOA (Modifier or additive use); USES (Uses)
(dopant; **fuel cell** having O-deficient perovskite-type oxide as protective layer on anode **side** of solid **electrolyte** for gas leakage prevention)
IT 54847-17-5P, Magnesium yttrium zirconium oxide 134883-97-9P, Calcium yttrium zirconium oxide 142448-13-3P, Barium cerium yttrium oxide 153728-43-9P, Calcium gadolinium zirconium oxide 158292-98-9P, Barium cerium gadolinium oxide 158292-99-0P, Barium cerium neodymium oxide 158970-15-1P, Cerium samarium strontium oxide 161077-89-0P, Calcium cerium yttrium oxide 163294-84-6P, Barium yttrium zirconium oxide 173353-18-9P, Cerium magnesium yttrium oxide 201597-65-1P, Magnesium neodymium zirconium oxide 201597-66-2P, Calcium neodymium zirconium oxide 201597-68-4P, Neodymium strontium zirconium oxide **201597-70-8P**, Strontium yttrium zirconium oxide 228264-87-7P, Gadolinium magnesium zirconium oxide 228264-88-8P, Magnesium scandium zirconium oxide 228264-89-9P, Magnesium samarium zirconium oxide 228264-90-2P, Calcium scandium zirconium oxide 228264-91-3P, Calcium samarium zirconium oxide 228264-92-4P, Gadolinium strontium zirconium oxide 228264-93-5P, Scandium strontium zirconium oxide 228264-94-6P, Samarium strontium zirconium oxide 228264-95-7P, Barium neodymium zirconium oxide 228264-96-8P, Barium gadolinium zirconium oxide 228264-97-9P, Barium scandium zirconium oxide 228264-98-0P, Barium samarium zirconium oxide 228264-99-1P, Cerium magnesium neodymium oxide 228265-00-7P, Cerium gadolinium magnesium oxide 228265-01-8P, Cerium magnesium scandium oxide 228265-02-9P, Cerium magnesium samarium oxide 228265-03-0P, Calcium cerium neodymium oxide 228265-04-1P, Calcium cerium gadolinium oxide 228265-05-2P, Calcium cerium scandium oxide 228265-06-3P, Calcium cerium samarium oxide 228265-07-4P, Cerium strontium yttrium oxide 228265-08-5P, Cerium neodymium strontium oxide 228265-09-6P, Cerium gadolinium strontium oxide 228265-10-9P, Cerium scandium strontium oxide 228265-11-0P, Barium cerium scandium oxide 228265-12-1P, Barium cerium samarium oxide
RL: DEV (Device component use); MOA (Modifier or additive use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(**fuel cell** having O-deficient perovskite-type oxide as protective layer on anode **side** of solid **electrolyte** for gas leakage prevention)

L379 ANSWER 86 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1998:678199 Document No. 130:17596 Structure and Chemical Composition of a Surfactant-Stabilized Pt3Sn Alloy Colloid. Boennemann, H.; Britz, P.; Vogel, W. (Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, 45470, Germany). Langmuir, 14(23), 6654-6657 (English) 1998. CODEN: LANGD5. ISSN: 0743-7463. Publisher: American Chemical Society.
AB A tetraoctylammonium-stabilized PtSn colloid with nominal composition Pt3Sn has been prepared by coredn. of the **metal salts.** This colloid, which is used in the manufacture of anode catalysts for low-**temperature** polymer membrane **fuel cells**, was **supported** on silica and the structure studied by in situ X-ray diffraction and Debye function anal. Results indicate that the **supported** colloid is best

described as a highly disordered bimetallic fcc cluster with a particle size of .apprx.1.3 nm. From TEM images a slightly larger size of 1.5 ± 4 nm is derived. Point-resolved EDX (energy-dispersive X-ray spectroscopy) confirms the elemental ratio of 3:1 in the PtSn particles. However, the XRD simulation indicates some deviations from uniform alloy formation. On removal of the stabilizing tetraoctylammonium ligands by heating the samples in He to .apprx.200°C, coalescence of neighboring particles occurs. The new alloy formed consists of a majority of cubic Pt0.81Sn0.19 particles, with average size 3.1 nm, and a minority phase of stoichiometric hexagonal PtSn, 4.4 nm in size. The former phase can be considered as a metastable supersatd. solid solution of Sn in Pt. The two phases are stable even on heating to 375°C for 1.5 h in He.

IT **7772-99-8**, Tin dichloride, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(structure and chemical composition of a surfactant-stabilized Pt3Sn alloy colloid)

RN 7772-99-8 HCAPLUS

CN Tin chloride (SnCl2) (8CI, 9CI) (CA INDEX NAME)

Cl— Sn— Cl

CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 67

IT **7772-99-8**, Tin dichloride, reactions 10025-65-7, Platinum dichloride 22560-21-0
RL: RCT (Reactant); RACT (Reactant or reagent)
(structure and chemical composition of a surfactant-stabilized Pt3Sn alloy colloid)

IT 7631-86-9, Silica, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**supports**; structure and chemical composition of a surfactant-stabilized Pt3Sn alloy colloid)

L379 ANSWER 87 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1998:283066 Document No. 128:310400 LSM-YSZ cathodes for medium-**temperature** solid oxide fuel cells. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208, USA). Proceedings - Electrochemical Society, 97-40(Solid Oxide Fuel Cells), 368-377 (English) 1997. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB The effect of cathode composition, processing, and structure on the performance of medium-**temperature** (600-800°) solid oxide **fuel cells (SOFCs)** is described. The **SOFC** cathodes were two-phase mixts. of (La1-xSrx)1-yMnO3 (LSM) and yttria-stabilized zirconia (YSZ). The **electrolytes** were <10 **.mu.m** thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO2 interfacial **layers.** The cathode overpotential was the primary factor limiting cell power densities. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current **area -specific resistance** of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ω cm2 at 750°. The use of LSM with y=0.1 suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was ≈40%. The maximum power densities measured in humidified H2 and air ranged from .apprx.110 mW/cm2 at 600 to 470 mW/cm2 at 800°.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Fuel cell cathodes
Solid state fuel cells

(lanthanum strontium manganite/yttria-stabilized zirconia
cathodes for medium-**temperature** solid oxide fuel cells)
IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); USES (Uses)
(ZrO2 stabilized with; lanthanum strontium manganite/yttria-
stabilized zirconia cathodes for medium-**temperature** solid
oxide fuel cells)
IT 108916-22-9, Lanthanum manganese strontium oxide la0.8mnsr0.2o3
112721-99-0 114168-16-0, Tz-8y 139737-59-0, Lanthanum manganese
strontium oxide la0.72mnsr0.18o3 188185-44-6, Cerium yttrium oxide
Ce0.84Y0.32O2.16
RL: DEV (Device component use); USES (Uses)
(lanthanum strontium manganite/yttria-stabilized zirconia
cathodes for medium-**temperature** solid oxide fuel cells)
IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); USES (Uses)
(yttria-stabilized; lanthanum strontium manganite/yttria-
stabilized zirconia cathodes for medium-**temperature** solid
oxide fuel cells)

L379 ANSWER 88 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1998:32507 Document No. 128:131285 Heavy-water (D2O) take-up-induced
lattice expansion in the high-**temperature proton**
conductor Ba3Ca1.18Nb1.82O9-δ. Papathanassopoulos,
Konstantinos; Wenzl, Helmut; Schober, Tilman (Inst. fur
Festkorperforschung, Julich, 52425, Germany). Journal of the
American Ceramic Society, 80(12), 3278-3280 (English) 1997. CODEN:
JACTAW. ISSN: 0002-7820. Publisher: American Ceramic Society.
AB Dimensional changes of the high-**temperature proton**
conductor Ba3Ca1.18Nb1.82O9-δ, when exposed to D2O
vapor, were investigated using length-change and precision d.
measurements. Such information is essential for possible
applications of **proton conductors** in solid oxide
fuel cells and humidity and hydrogen sensors. A
linear increase of the sample lengths with increases in the
deuterium content was observed Comparison of the present D2O data with
those that were previously obtained for H2O showed that there was a
small isotope effect in the lattice expansion. The fact that the
length-change-vs.-hydrogen-isotope-concentration curves were almost isotope
independent **supported** the validity of the take-up reaction
according to Wagner classic equation (1996). In regard to the this
equation, it was found that small islands of silver, palladium,
nickel, and platinum act as catalytic promoters of the reaction and
lead, for given heavy-water-steam exposure conditions, to an
increase of water absorption of up to 100%, when compared with
samples without the catalytic **surface** layers.
IT **158634-63-0D**, Barium calcium niobium oxide
(Ba3Ca1.18Nb1.82O9), oxygen-deficient
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)
(**proton conductor**; heavy-water (D2O)
take-up-induced lattice expansion in high-**temperature**
proton conductor Ba3Ca1.18Nb1.82O9-δ)
RN 158634-63-0 HCAPLUS
CN Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O9) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 57-2 (Ceramics)

Section cross-reference(s): 52, 76
ST barium calcium niobate **proton conductor**
expansion; heavy water lattice expansion **proton**
conductor; niobate **proton conductor**
heavy water expansion
IT Electric **conductors**
(barium calcium niobate; heavy-water (D2O) take-up-induced
lattice expansion in high-**temperature proton**
conductor Ba3Ca1.18Nb1.82O9-δ)
IT Crystal structure
(lattice expansion; heavy-water (D2O) take-up-induced lattice
expansion in high-**temperature proton**
conductor Ba3Ca1.18Nb1.82O9-δ)
IT Expansion
(lattice; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor**
Ba3Ca1.18Nb1.82O9-δ)
IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4,
Platinum, uses 7440-22-4, Silver, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor**
Ba3Ca1.18Nb1.82O9-δ)
IT **158634-63-0D**, Barium calcium niobium oxide
(Ba3Ca1.18Nb1.82O9), oxygen-deficient
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)
(**proton conductor**; heavy-water (D2O)
take-up-induced lattice expansion in high-**temperature**
proton conductor Ba3Ca1.18Nb1.82O9-δ)
IT 7732-18-5, Water, processes
RL: MOA (Modifier or additive use); PEP (Physical, engineering or
chemical process); PROC (Process); USES (Uses)
(uptake; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor**
Ba3Ca1.18Nb1.82O9-δ)

L379 ANSWER 89 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1998:9778 Document No. 128:50630 **Proton-conducting**
cerate ceramics. Pederson, L. R.; Coffey, G. W.; Bates, J. L.;
Weber, W. J. (Pacific Northwest National Laboratory, Richland, WA,
99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP
(United States), ORNL/FMP-96/1, Proceedings of the Tenth Annual
Conference on Fossil Energy Materials, 1996, 311-318 (English) 1996.
CODEN: ORFMEY.
AB Single-**cell** solid oxide **fuel cells**
were constructed using strontium create as the **electrolyte**
and their performance tested. Like certain zirconates, hafnates,
and tantalates, the cerate perovskites are among a class of solid
electrolytes that **conduct protons** at
elevated **temps.** Depending on the **temperature** and
chemical environment, these ceramics also **support** electronic
and oxygen **ion** currents. A maximum power output of
≈100 mW per cm2 **electrolyte surface** area
was obtained at 900°C using 4% hydrogen as the fuel and air
as the oxidant. A series of rare earth/ceria/zirconia were prepared
and their elec. properties characterized. Rare earth dopants
included ytterbia, yttria, terbia, and europia. **Ionic**
conductivities were highest for rare earth/ceria and rare earth
zirconia compns.; a min. in **ionic** conductivity for all series
were found for equimolar mixts. of ceria and zirconia. Cerium
oxysulfide is of interest in fossil energy applications because of
its high chemical stability and refractory nature. An alternative
synthesis route to preparing cerium oxysulfide powders have been
developed using combustion techniques.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 57, 76
ST solid oxide **fuel cell electrolyte**;
strontium create **electrolyte fuel cell**
; rare earth ceria zirconia **ionic** cond
IT **Fuel cell electrolytes**
Ionic conductivity
Solid state **fuel cells**
(**proton-conducting** cerate ceramic
electrolytes for solid oxide **fuel cells**
)
IT 200067-60-3, Cerium ytterbium oxide (Ce0.8Yb2O4.6) 200067-61-4, Ytterbium zirconium oxide (Yb2Zr0.8O4.6) 200067-62-5, Cerium ytterbium zirconium oxide (Ce0.1Yb2Zr0.7O4.6) 200067-63-6, Cerium ytterbium zirconium oxide (Ce0.2Yb2Zr0.6O4.6) 200067-64-7, Cerium ytterbium zirconium oxide (Ce0.6Yb2Zr0.2O4.6) 200067-65-8, Cerium ytterbium zirconium oxide (Ce0.4Yb2Zr0.4O4.6) 200067-66-9, Cerium yttrium oxide (Ce0.8Y2O4.6) 200067-67-0, Yttrium zirconium oxide (Y2Zr0.8O4.6) 200067-68-1, Cerium yttrium zirconium oxide (Ce0.1Y2Zr0.7O4.6) 200067-69-2, Cerium yttrium zirconium oxide (Ce0.2Y2Zr0.6O4.6) 200067-71-6, Cerium yttrium zirconium oxide (Ce0.6Y2Zr0.2O4.6) 200067-72-7, Cerium yttrium zirconium oxide (Ce0.4Y2Zr0.4O4.6) 200067-73-8, Cerium terbium oxide (Ce0.8Tb2O4.6) 200067-74-9, Terbium zirconium oxide (Tb2Zr0.8O4.6) 200067-75-0, Cerium terbium zirconium oxide (Ce0.1Tb2Zr0.7O4.6) 200067-76-1, Cerium terbium zirconium oxide (Ce0.2Tb2Zr0.6O4.6) 200067-77-2, Cerium terbium zirconium oxide (Ce0.6Tb2Zr0.2O4.6) 200067-78-3, Cerium terbium zirconium oxide (Ce0.4Tb2Zr0.4O4.6) 200067-79-4, Cerium europium oxide (Ce0.8Eu2O4.6) 200067-80-7, Europium zirconium oxide (Eu2Zr0.8O4.6) 200067-81-8, Cerium europium zirconium oxide (Ce0.1Eu2Zr0.7O4.6) 200067-82-9, Cerium europium zirconium oxide (Ce0.2Eu2Zr0.6O4.6) 200067-83-0, Cerium europium zirconium oxide (Ce0.6Eu2Zr0.2O4.6) 200067-84-1, Cerium europium zirconium oxide (Ce0.4Eu2Zr0.4O4.6)
RL: DEV (Device component use); USES (Uses)
(**proton-conducting** cerate ceramic
electrolytes for solid oxide **fuel cells**
)

L379 ANSWER 90 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1997:740153 Document No. 127:360570 Method of manufacturing composite membrane structures comprising a thin **metal** membrane for use in selective diffusion of gases. Bredesen, Rune; Klette, Hallgeir (Sintef, Norway; Bredesen, Rune; Klette, Hallgeir). PCT Int. Appl. WO 9740914 A1 19971106, 17 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (Norwegian). CODEN: PIXXD2. APPLICATION: WO 1997-NO109 19970425. PRIORITY: NO 1996-1739 19960430.
AB Method for manufacturing a composite membrane structure comprising a thin **metal** membrane, e.g., **silver**, **palladium** or **palladium alloys**, for use in selective diffusion of gases. The **metal** for the membranes is applied by sputtering and/or vapor deposition to base member having low **surface** roughness in a desired thickness, the **coating** is pulled off from the base member to form a membrane, and the **metal** membrane is placed on a **supporting** substrate. The **metal** is selected from **Ag**, **Pd**, and **Pd alloys**.
IT **7440-05-3**, **Palladium**, uses **7440-22-4**, **Silver**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(membranes, **supported**; for selective separation of gases)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM B01D039-10
ICS B01D053-22
CC 48-1 (Unit Operations and Processes)
Section cross-reference(s): 49, 52
ST gas diffusion **metal** membrane **support**; **silver** membrane **support** sensor; **palladium alloy** membrane **support**; cylinder **metal** membrane sputtering; vapor deposition **metal** membrane cylinder; silicon **metal** membrane sputtering; glass **metal** membrane sputtering; quartz **metal** membrane sputtering; oxide **metal** membrane sputtering
IT Cylinders
(base members; in **supported metal** membrane manufacture for selective separation of gases)
IT Nitrides
Oxides (inorganic), uses
RL: TEM (Technical or engineered material use); USES (Uses)
(base members; in **supported metal** membrane manufacture for selective separation of gases)
IT **Metals**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(membranes, **supported**; for selective separation of gases)
IT Membranes, nonbiological
RL: TEM (Technical or engineered material use); USES (Uses)
(**metallic**, **supported**; for selective separation of gases)
IT Electrodes
(**silver** or **palladium** and **palladium alloy** membranes; for oxygen-conductive or **hydrogen-conductive electrolytes** in **fuel cells** and gas sensors)
IT Gases
(**supported metal** membrane manufacture for selective separation of)
IT **Fuel cells**
Sensors
(**supported** thin **metal** membrane manufacture for)
IT **Palladium alloy**
RL: TEM (Technical or engineered material use); USES (Uses)
(membranes, **supported**; for selective separation of gases)
IT 7440-21-3, Silicon, uses 14808-60-7, Quartz, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(base members; in **supported metal** membrane manufacture for selective separation of gases)
IT **7440-05-3**, **Palladium**, uses **7440-22-4**, **Silver**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(membranes, **supported**; for selective separation of gases)
IT 1333-74-0P, Hydrogen, preparation
RL: PUR (Purification or recovery); PREP (Preparation)
(**supported** thin **metal** membrane manufacture for purification of)

L379 ANSWER 91 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1997:138492 Document No. 126:227570 Effect of LSM-YSZ cathode on thin-**electrolyte** solid oxide **fuel cell** performance. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, USA). Solid State Ionics, 93(3,4), 207-217 (English) 1997. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier.

AB The effect of cathode composition, processing and structure on the performance of medium-**temperature** (600-800°) solid oxide **fuel cells** (**SOFCs**) is described. The cathodes and phys. **supports** for the **SOFCs** were two-phase mixts. of (La1-xSrx)1-yMnO3 (LSM) and Yttria-stabilized Zirconia (YSZ), the **electrolytes** were <10 μ**m** thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO2 interfacial **layers.** It was found that the cathode overpotential was the primary factor limiting cell power densities during operation with air as the oxidant and humidified hydrogen as the fuel. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current **area-specific resistance** of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ωcm2. The use of LSM with y = 0.1 suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was ≈40%. Decreasing the cathode porosity below ≈30% resulted in a mass transport limitation at high current densities due to the small pore size (<0.5 **.mu.m**) and large cathode thickness (≈1 mm). The maximum power densities measured in humidified H2 and air ranged from .apprx.110 mWcm-2 at 600 to 470 mWcm-2 at 800°.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT **Fuel cell** cathodes
(effect of lanthanum strontium manganite/Y2O3-stabilized ZrO2 cathode on thin-**electrolyte** solid oxide **fuel cell** performance)

IT 188185-44-6, Cerium yttrium oxide (Ce0.84Y0.32O2.16)
RL: DEV (Device component use); USES (Uses)
(anode interfacial **layer**; effect of lanthanum strontium manganite/Y2O3-stabilized ZrO2 cathode on thin-**electrolyte** solid oxide **fuel cell** performance)

IT 112721-99-0
RL: DEV (Device component use); USES (Uses)
(anodes; effect of lanthanum strontium manganite/Y2O3-stabilized ZrO2 cathode on thin-**electrolyte** solid oxide **fuel cell** performance)

IT 108916-22-9, Lanthanum manganese strontium oxide La0.8MnSr0.2O3
114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)
139737-59-0, Lanthanum manganese strontium oxide La0.72MnSr0.18O3
188185-43-5, Lanthanum manganese strontium oxide (La0.79MnSr0.19O3)
RL: DEV (Device component use); USES (Uses)
(effect of lanthanum strontium manganite/Y2O3-stabilized ZrO2 cathode on thin-**electrolyte** solid oxide **fuel cell** performance)

L379 ANSWER 92 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1996:315458 Document No. 124:348141 Solid polymer **electrolyte fuel cells** and their manufacture. Imahashi, Jinichi; Horiba, Tatsuo (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 08088011 A2 19960402 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-222332 19940919.

AB The **fuel cells** have a pair of electrodes having gas diffusion layers on the opposite **sides** of a solid polymer **electrolyte** membrane and means for supplying reaction gas for the electrodes; where either or both electrodes have a catalyst layer on the **electrolyte** membrane

side of the gas diffusion layer, and the **electrolyte** membrane has, at least on 1 **side**, a copptd. layer containing an active material. The copptd. layer contains at least a C **support**, an active material, e.g., a Pt group **metal**, loaded on the **support**, a **proton conductor**, and a hydrophobic binder. The **fuel cells** are manufactured by adding a mixture containing a Pt compound, the C **support**, the **proton conductor**, and the binder on the top **side** of a polymer **electrolyte** membrane in a sealed container; stirring the mixture; adding a reducing agent to the bottom **side** of the **electrolyte** membrane; heating the container at a predetd. **temperature** for a predetd. period to reduce the Pt compound to form the copptd layer on the **electrolyte** membrane; applying a paste containing C or Pt laded C catalyst powder, the **proton conductor**, and the hydrophobic binder to form the gas diffusion layers; drying at a predetd. **temperature** to form the electrodes; and hot pressing.

IC ICM H01M008-02
ICS H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST solid polymer **electrolyte fuel cell** manuf; copptn catalyst layer **fuel cell**

IT **Fuel cells**
(**fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**, **fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT Fluoropolymers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**, **fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT **Ionomers**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, **fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT 7440-06-4, Platinum, uses 7782-42-5, Graphite, uses
RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT 9002-84-0, Ptfe
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**fuel cells** having copptd. layers containing catalyst and **proton conductor** and hydrophobic binder on solid polymer **electrolyte** membranes and their manufacture)

IT 50-00-0, Formalin, reactions 302-01-2, Hydrazine, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reducing agent in manufacture of copptd. layers containing catalyst and

proton conductor and hydrophobic binder on
solid polymer **electrolyte** membranes for **fuel
cells**)

L379 ANSWER 93 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1996:30548 Document No. 124:161486 Advanced electrolytes and synthesis of advanced catalysis and membrane materials. Armstrong, T. R.; Bates, J. L.; Coffey, G. W.; Kingsley, J. J.; Pederson, I. R.; Stevenson, J. W.; Weber, W. J.; Youngblood, G. E. (Pacific Northwest Lab., Richland, WA, 99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP (United States), ORNL/FMP--94/1, Proceedings of the Eighth Annual Conference on Fossil Energy Materials, 1994, 89-96 (English) 1994. CODEN: ORFMEY.

AB Mixed **conductors** in the lanthanum strontium cobalt chromium iron oxide system and **protonic conductors** in the strontium ytterbium cerate system are being evaluated for possible use in gas separation and purification, as **electrolytes** and electrodes in solid oxide **fuel cells**, and as sensors. Recent activities include materials synthesis, sintering behavior studies, and microstructural characterization, development of methods to prepare novel shapes, elec. property characterization, and permeation testing. Single-phase LaSrCoCrFe oxides, being investigated for use as dense oxygen separation membranes, have been prepared by combustion methods. Sintering conditions were developed to obtain full d. The addition of up to 10 mol% chromium, intended to improve the stability in a reducing environment, also significantly enhanced densification via liquid phase sintering. Compns. having a high A-site strontium content (80% or greater) were susceptible to internal cracking during cooling, due to large changes in oxygen stoichiometry. These are highly (mixed) conductive materials, with activation energies for conduction in the 0.08 to 0.17 eV range and conductivities to more than 500 S/cm. Passive oxygen fluxes varied with **temperature**, composition, and the oxygen concentration gradient. At 1000°, high- purity oxygen fluxes in excess of 1 sccm/cm2 **surface** area of the membrane were observed **Protonic conductivity** in the strontium ytterbium cerates was shown to have a large grain boundary component. **Protonic conductivity** in these materials requires the presence of water, which reacts with oxygen vacancies to yield hydroxyl groups that **support proton conduction.** Transference nos. were determined for protons, oxygen **ions**, and electrons as a function of **temperature** **Protonic conduction** dominated in hydrated cerates up to 450°. At higher **temps.**, oxygen **ion** and electronic conductivity became progressively more important. Hydrogen could be pumped across the cerate membrane by applying a d.c. voltage. At 800°, pure **hydrogen fluxes** greater than 1 sccm/cm2 could be driven across the membrane.

CC 76-2 (Electric Phenomena)
Section cross-reference(s): 52

ST electrolyte lanthanum strontium cobalt iron oxide; **proton conductor** strontium cerium ytterbium oxide; catalyst mixed oxide synthesis; membrane mixed oxide synthesis

IT 110687-91-7D, Cerium Strontium Ytterbium oxide (Ce0.95SrYb0.05O3), oxygen-deficient 122573-60-8D, Cerium Strontium Ytterbium oxide (Ce0.9SrYb0.1O3), oxygen-deficient 144438-87-9D, Cerium Strontium Ytterbium oxide (Ce0.85SrYb0.15O3), oxygen-deficient
RL: PRP (Properties)
(**protonic conduction** in)

L379 ANSWER 94 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1995:767898 Document No. 123:180363 **Supported metal** catalyst and its manufacture. Yamaguchi, Motoo; Kobayashi, Kenzo; Matsuo, Hisahide; Uozumi, Shohei (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 07155618 A2 19950620 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-304957 19931206.

AB The catalyst is manufactured by bombarding a C **support** with **ionic** or atomic beams to form C-**supported** **metal** particles. The catalysts may contain Pt, Au, **Ag**, **Pd**, Ru, and/or Rh and promoters containing particles selected from **Fe**, **Ni**, Co, **Cr** , Ir, Ga, **Ti**, **V**, and Al. The process uses an **ion**-implantation apparatus The catalyst is useful for electrodes for **fuel cells**, oxidation catalysts for hydrocarbons or CO, etc. The catalyst showed high activity.

IT **7440-05-3**, **Palladium**, uses **7440-22-4**, **Silver**, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT **7440-02-0**, **Nickel**, uses **7440-32-6**, **Titanium**, uses **7440-47-3**, **Chromium**, uses **7440-62-2**, **Vanadium**, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(promoter; high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM B01J035-02
ICS B01J021-18; B01J023-40; B01J023-48; B01J023-62; B01J023-64;
B01J023-66; B01J023-89; B01J037-02; H01M004-88; H01M004-90
CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 51, 52
ST **metal** catalyst carbon **support** beam bombardment;
ion beam **metal** catalyst manuf; atom beam **metal**
catalyst manuf
IT Fluoropolymers
RL: TEM (Technical or engineered material use); USES (Uses)
(adhesive; high-activity carbon-**supported metal**
catalyst and its manufacture by bombardment using ion-implantation
apparatus)
IT Atomic beams
Catalysts and Catalysis
Ion beams
(high-activity carbon-**supported metal**
catalyst and its manufacture by bombardment using ion-implantation
apparatus)
IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(**support**, Denkablack; high-activity carbon-
supported metal catalyst and its manufacture by
bombardment using ion-implantation apparatus)
IT **7440-05-3, Palladium**, uses 7440-06-4, Platinum,
uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
7440-22-4, Silver, uses 7440-57-5, Gold, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical
process); PROC (Process); USES (Uses)
(high-activity carbon-**supported metal**
catalyst and its manufacture by bombardment using ion-implantation
apparatus)
IT 7429-90-5, Aluminum, uses 7439-88-5, Iridium, uses 7439-89-6,
Iron, uses **7440-02-0, Nickel**, uses
7440-32-6, Titanium, uses **7440-47-3,**
Chromium, uses 7440-48-4, Cobalt, uses 7440-55-3,
Gallium, uses **7440-62-2, Vanadium**, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical
process); PROC (Process); USES (Uses)
(promoter; high-activity carbon-**supported metal**
catalyst and its manufacture by bombardment using ion-implantation
apparatus)
IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); USES (Uses)
(**support**; high-activity carbon-**supported**
metal catalyst and its manufacture by bombardment using
ion-implantation apparatus)

L379 ANSWER 95 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1995:440321 Document No. 122:269993 Study of radiation-grafted
FEP-g-polystyrene membranes as polymer **electrolytes** in
fuel cells. Buchi, Felix N.; Gupta, Bhuvanesh;
Haas, Otto; Scherer, Gunther G. (Paul Scherrer Inst., Villigen PSI,
CH-5232, Switz.). Electrochimica Acta, 40(3), 345-53 (English)
1995. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier.
AB Proton exchange membranes for **fuel cell**
applications were synthesized by pre-irradiation grafting of
styrene/divinylbenzene mixts. into poly(fluoroethylene-co-
hexafluoropropylene) **films** and subsequent sulfonation.
Grafting of pre-existing **films** overcomes the problem of
shaping the grafted polymer into thin membranes and makes this
process a potentially cheap and easy technique for the preparation of
solid polymer **electrolytes.** The grafted membranes were
characterized by measuring their **ion** exchange capacity,
swelling, **specific** resistivity and **area**

resistance. Due to their thickness in the range 67-211 .
mu.m, some of the membranes have a considerably
lower resistance than the most widely used membrane Nafion 117. The
short-term and long-term performance of these membranes was
investigated in H/O **fuel cells.** Thin (<100 .
mu.m), highly crosslinked (12% divinylbenzene)
membranes show the best performance in the **fuel**
cells. Tests for periods of ≤1400 h were performed
to examine membrane stability and the degradation of grafted membranes.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

IT Fluoropolymers
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(membranes; preparation of membranes of fluoroethylene-
hexafluoropropylene polymer radiation-grafted with styrene and
divinylbenzene and subsequently sulfonated as polymer
electrolytes in **fuel cells**)

IT **Fuel cells**
(separators, proton exchange; preparation of membranes of
fluoroethylene-hexafluoropropylene polymer radiation-grafted with
styrene and divinylbenzene and subsequently sulfonated as polymer
electrolytes in **fuel cells**)

IT 25067-11-2D, Tetrafluoroethylene-hexafluoropropylene copolymer,
radiation-grafted with styrene and divinylbenzene, sulfonated
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(crosslinked; preparation of membranes of fluoroethylene-
hexafluoropropylene polymer radiation-grafted with styrene and
divinylbenzene and subsequently sulfonated as polymer
electrolytes in **fuel cells**)

IT 100-42-5D, Styrene, fluoroethylene-hexafluoropropylene polymer
radiation-grafted with 1321-74-0D, Divinylbenzene,
fluoroethylene-hexafluoropropylene polymer radiation-grafted with
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(preparation of membranes of fluoroethylene-hexafluoropropylene
polymer radiation-grafted with styrene and divinylbenzene and
subsequently sulfonated as polymer **electrolytes** in
fuel cells)

L379 ANSWER 96 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:518495 Document No. 121:118495 Potential-Dependent Wetting of
Aqueous Solutions on Self-Assembled Monolayers Formed from
15-(Ferrocenylcarbonyl)pentadecanethiol on Gold. Abbott, Nicholas
L.; Whitesides, George M. (Department of Chemistry, Harvard
University, Cambridge, MA, 02138, USA). Langmuir, 10(5), 1493-7
(English) 1994. CODEN: LANGD5. ISSN: 0743-7463.

AB Aqueous solns. of 0.1 M NaClO4 (pH 1.5, 10 mM **KH2PO4**) show
potential-dependent wetting on self-assembled monolayers (SAMs)
formed from 15-(ferrocenylcarbonyl)pentadecanethiol(FcCO(CH2)15SH;
Fc = [η5-C5H5]Fe[η5-C5H5]) adsorbed on Au
surfaces. Contact angles (θ) decreased from 71 to
43° (Δ cos θ = -0.40) when the elec. potential of
the SAM was increased from 0.3 to 0.5 V (vs. a Ag wire reference
electrode) and then increased from 43 to 58° when the
potential of the SAM was returned to 0.2 V. Repeated cycling
between these potentials leads to a progressively decreasing
response, as the **Fc** groups are destroyed by **side**
reactions. Contact angles of aqueous solns. on SAMs formed from
CH3(CH2)17SH decrease by only 2° (from .apprx. 115 to
113°, Δ cos θ = 0.05) over the same range of
potentials (J. Sondag-Huethorst and L. Fokkink, 1992). The
contrast between the wettability of SAMs terminated with **Fc**
and CH3 groups suggests that potential-dependent wetting of the
former is caused primarily by the electrochem. oxidation of the elec.

neutral, **surface**-confined **Fc** to the more polar and plausibly more wettable **Fc+ cation.** Linear sweep cyclic voltammetric measurements **support** this hypothesis. **Surfaces** of Au patterned with SAMs formed from FcCO(CH2)15SH and CH3(CH2)15SH were used to construct a micrometer-scale "gate" that controls the flow of liquid down a **surface.**

CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 47, 72, 76

ST micrometer gate **surface** flow control liq; potential dependent wetting self assembled monolayer; ferrocenylcarbonylpentadecanethiol self assembled monolayer gold electrowetting; electrochem oxidn ferrocenylcarbonylpentadecanethiol monolayer gold wetting

IT Valves
(micrometer-scale., electrochem., ferrocenylcarbonylpentadecanethiol self-assembled monolayers on gold as, for flow control of liqs. on **surfaces**)

IT 2917-26-2, 1-Hexadecanethiol
RL: PRP (Properties)
(self-assembled monolayers, on gold, potential-dependent wetting and micrometer-scale gates for liquid flow on **surfaces** in relation to)

L379 ANSWER 97 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1994:222481 Document No. 120:222481 Manufacture of membrane-electrode assemblies for electrochemical cells and manufactured assemblies. Swathirajan, Sundararajan; Mikhail, Youssef M. (General Motors Corp., USA). Can. Pat. Appl. CA 2081063 AA 19931004, 49 pp. (English). CODEN: CPXXEB. APPLICATION: CA 1992-2081063 19921021. PRIORITY: US 1992-862691 19920403.

AB A combination, unitary, membrane **electrolyte** and electrode assembly is provided with a solid polymer **electrolyte** membrane, and 1st and 2nd electrodes at least partly embedded in opposed **surfaces** of the membrane. Each electrode comprises a resp. group of finely divided C particles, very finely divided catalytic particles **supported** on internal and external **surfaces** of these particles, and a **proton -conductive** material mixed with the catalytic and C particles. A 1st group of finely divided C particles forming the 1st electrode has greater H2O attraction and retention properties and is relatively more hydrophilic and less hydrophobic than a 2nd group of C particles forming the 2nd electrode. In a preferred version, the membrane electrode assembly of the invention is prepared by forming a slurry of **proton-conductive** material and ≥1 group of finely divided C particles and very finely divided catalytic particles **supported** on and in the carbon particles. The slurry is applied to the opposed **surfaces** of the membrane, and heated while being pressed to the membrane for a sufficient time and at a **temperature** and compressive load sufficient to embed at least a portion of the particles into the membrane to form the assembly. The invention is applicable to **fuel cells** and electrochem. cells in general.

IC ICM H01M004-96
ICS H01M008-10; H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST **electrolyte** electrode assembly electrochem cell; **fuel cell electrolyte** electrode assembly; polymer **electrolyte** membrane electrode assembly; carbon particle electrode **electrolyte** assembly

IT **Fuel-cell electrolytes**
(polymer membrane, assembly of electrodes and, manufacture of)

IT Electrodes
(**fuel-cell**, in assembly with polymer membrane

electrolyte, manufacture of)

L379 ANSWER 98 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:81684 Document No. 120:81684 γ-Lithium aluminate and its manufacture for molten carbonate **fuel-cell electrolyte** matrixes. Yamazaki, Nobuyuki; Negishi, Katsuyuki (Nippon Chemical Ind, Japan). Jpn. Kokai Tokkyo Koho JP 05294614 A2 19931109 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-131620 19920423.
AB The γ-Li aluminate is a fine powder with 1st particle average maximum diameter 0.5 **.mu.m**, round shape, and BET sp. **surface** area ≥5 m2/g. The product is manufactured from fine powdered alumina with BET sp. **surface** area ≥10 m2/g and Li2CO3 with average particle diameter ≤10 μ **m** by mixing uniformly and heating at ≥800°. The product shows high **sp. surface area** , heat **resistance**, and low water absorption.
IC ICM C01F007-04
ICS H01M008-02
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium aluminate **electrolyte fuel cell**
IT **Fuel-cell electrolytes**
(matrixes, γ-lithium aluminate manufacture for, for molten-carbonate **fuel cells**)
IT 554-13-2, Lithium carbonate
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with alumina, γ-lithium aluminate from, for **fuel-cell electrolyte** matrix)
IT 1344-28-1, Alumina, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with lithium carbonate, γ-lithium aluminate from, for **fuel-cell electrolyte** matrix)
IT 37220-89-6P, Lithium aluminate
RL: PREP (Preparation)
(γ-, **electrolyte** matrix, for molten-carbonate **fuel cells**, manufacture of)

L379 ANSWER 99 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:58561 Document No. 120:58561 Secondary **hydride** batteries with storage stability and low-self discharge. Fukunaga, Hiroshi (Hitachi Maxell, Japan). Jpn. Kokai Tokkyo Koho JP 05258748 A2 19931008 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-89598 19920313.
AB The batteries comprise NiO or **Ni**(OH)2-containing cathodes, H-absorbing alloy anodes **supported** with anionic surfactants on their **surfaces**, and aqueous alkali electrolytes. Preferably, the amts. of the surfactants are 0.01-0.1% to the H-absorbing alloys.
IC ICM H01M004-24
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 46
IT 2991-51-7, **FC** 129
RL: USES (Uses)
(**anionic** surfactants, in hydrogen-absorbing alloy anodes for batteries)

L379 ANSWER 100 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:40365 Document No. 120:40365 Studies on **proton conducting** ceramics based on perovskite-type oxides. Iwahara, Hiroyasu; Hibino, Takashi; Yajima, Tamotsu (Sch. Eng., Nagoya Univ., Nagoya, 464-01, Japan). Nippon Kagaku Kaishi (9), 1003-11 (Japanese) 1993. CODEN: NKAKB8. ISSN: 0369-4577.
AB Good **proton conducting** solids usable at high **temperature** are applicable to a solid **electrolyte** for high **electrolytic** current devices like a **fuel**

cell, an electrolyzer for hydrogen production, a hydrogen separator. etc., as well as for a high **temperature**-type chemical sensor. Such materials had been scarcely known until oxide ceramics which have appreciable **protonic conduction** under hydrogen-containing atmospheric at high **temperature** were found. They are perovskite-type oxides based on SrCeO3 or BaCeO3 in which some trivalent **cations** are partially substituted for cerium. SrCe0.95Yb0.05O3-α, BaCe0.9Nd0.1O3-α, etc., belong to this class of **conductors.** Later, some zirconate-base sintered oxides also are **proton conductors** under hydrogen containing atmospheric at high **temperature** These oxide ceramics exhibit p-type electronic conduction in an atmospheric free from hydrogen or water vapor. However, when water vapor or hydrogen is introduced to the atmospheric at high **temperature**, electronic conductivity decreases and **protonic conduction** appears. When the ceramics are exposed to the hydrogen gas, they become almost pure **protonic conductors**, the conductivities of which are multi 10-2 S cm-1 at 1000° and multi 10-3 S cm-1 at 600°. **Protonic conduction** in these solids could be verified by electrochem. permeation of hydrogen across the ceramics. These oxides are unique **ionic conductors** in respect that they have no host constituents which liberate conducting **ion** (proton). Using these ceramics as a solid **electrolyte**, several types of electrochem. devices were demonstrated by way of experiment Based on the principle of hydrogen concentration cell, hydrogen sensors have put to practical use for molten aluminum in casting process.

IT **131960-38-8D**, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3), oxygen-deficient
RL: PRP (Properties)
(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)

RN 131960-38-8 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 56, 57, 75, 76

ST hydrogen electroevolution perovskite oxide; cond perovskite oxide **proton conductor**; crystal structure barium rare earth oxide

IT Rare earth **metals**, compounds
RL: PRP (Properties)
(barium oxides, lattice parameters and proton transport number for)

IT Electric conductivity and conduction
Electric **conductors**
(ionic, of perovskite-type oxides, by protons)

IT 110687-91-7D, Cerium strontium ytterbium oxide (Ce0.95SrYb0.05O3), oxygen-deficient 112235-03-7D, Barium cerium neodymium oxide bace0.9nd0.1o3, oxygen-deficient **131960-38-8D**, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3), oxygen-deficient 142107-79-7D, Calcium indium zirconium oxide (CaIn0.1Zr0.9O3), oxygen-deficient
RL: PRP (Properties)
(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)

IT 1333-74-0P, Hydrogen, preparation
RL: PREP (Preparation)

(evolution of, electrochem., perovskite-type oxide **proton conducting** electrolytes for)

L379 ANSWER 101 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1993:156618 Document No. 118:156618 Use of electrochemical techniques to study the thermodynamic and kinetic properties of **palladium**-hydrogen and **palladium**-lithium-hydrogen systems. Falanga, A. (Cent. Doct. Armement, Dir. Rech., Paris, Fr.). Report, Order No. PB91-199323, 51 pp. Avail. NTIS From: Gov. Rep. Announce. Index (U. S.) 1991, 92(2), Abstr. No. 202,564 (French) 1991.

AB The development is described of a **fuel cell** adapted to the study of **hydride** properties near room **temperature** for application to research on the thermodn. and kinetics properties of **Pd**-H and **Pd**-Li-H systems. Besides the design of the cell itself, the effect of **electrolyte** purity, the **surface** condition and **metallurgical** structure of the material under study, and its previous activation under H were studied. The electrochem. techniques were extended to higher **temps.** (400°) using LiCl-KCl eutectic mixts. and applied to the study of **metal hydrides** and **Pd**/Li. When the material under study and the **electrolyte** are correctly coupled, electrochem. methods provide highly useful information on the thermodn. and transport properties of different systems. The titration curves, kinetics properties, and H chemical-diffusion coeffs. of **Pd**-H and **Pd**-Li-H systems were all obtained. The advantages of electrochem. techniques over conventional ones include easier use and more rapid results, the ability to explore a broader pressure area with the same equipment, greater sensitivity to low H concns., and nearly simultaneous determination of thermodn. and kinetics properties.

IT **7440-05-3**, **Palladium**, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of, in system with hydrogen and without lithium, electrochem. technique in study of)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 56, 65, 67, 68, 69

ST thermodn kinetic property electrochem technique study; hydrogen **palladium** system thermodn kinetic property; fuel cell **hydride** property; lithium potassium chloride electrochem technique **hydride**

IT Fuel cells
(**hydride** properties in relation to)

IT Diffusion
(of hydrogen in **palladium**-hydrogen and **palladium**-lithium-hydrogen systems)

IT Thermodynamics
(of **palladium**-hydrogen and **palladium** -lithium-hydrogen systems, electrochem. techniques in study of)

IT 7439-93-2, Lithium, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium** system with hydrogen and, electrochem. technique in study of)

IT 1333-74-0, Hydrogen, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium** system with, with and without lithium, electrochem. study of)

IT 7447-40-7, Potassium chloride, properties

RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium** -hydrogen and **palladium**-lithium-hydrogen systems in lithium chloride eutectic with, electrochem. techniques in study of)

IT 7447-41-8, Lithium chloride, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium** -hydrogen and **palladium**-lithium-hydrogen systems in potassium chloride eutectic with, electrochem. techniques in study of)

IT 12648-42-9, **Palladium hydride**
RL: PRP (Properties)
(thermodn. and kinetics properties of, electrochem. technique in study of)

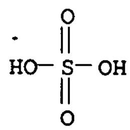
IT **7440-05-3**, **Palladium**, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of, in system with hydrogen and without lithium, electrochem. technique in study of)

L379 ANSWER 102 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:580493 Document No. 117:180493 Electroactive hexaammineruthenium(3+) gallery cations in clay-modified electrodes. Kaviratna, P. de S.; Pinnavaia, Thomas J. (Cent. Fundam. Mater. Res., Michigan State Univ., East Lansing, MI, 48824, USA). Journal of Electroanalytical Chemistry, 332(1-2), 135-45 (English) 1992. CODEN: JECHES.

AB Ru(NH3)63+-laponite and -montmorillonite films **supported** on graphite electrodes exhibited cyclic voltammograms with a well-defined Ru(NH3)63+/2+ wave even when the complex ion loading was less than the cation exchange capacity of the clay film. Coulometry indicated that >80% of the Ru(NH3)63+ electrostatically bound at the cation exchange sites of the gallery **surfaces** was electroactive. Further confirmation of the presence of electroactive gallery exchange cations was obtained by comparing the electrochem. behavior of the Ru(NH3)63+ montmorillonite with montmorillonite containing Fe(bpy)32+ (2,2'-bipyridine) exchange ions and [Fe(bpy)32+][SO42-] ion pairs. In this latter system, the ion-paired [Fe(bpy)32+][SO42-] centers are electroactive, but the gallery Fe(bpy)32+ exchange cations are rigorously electroinactive. The concentration and nature of the cation in the **supporting** electrolyte greatly affected the peak currents of the Ru(NH3)63+ clay, whereas the electroactivity of the [Fe(bpy)32+][SO42-] centers were not affected by the electrolyte cation. The decrease in the electroactivity of Ru(NH3)63+ montmorillonite with increasing electrolyte concentration was attributable to the exchange of Ru(NH3)63+ by electrolyte cations. A mechanism is suggested for maintaining elec. neutrality upon electron transfer in these clay films.

IT **10294-54-9**, Dicesium sulfate
RL: PRP (Properties)
(**supporting** electrolyte, depletion of electroactivity for hexaammineruthenium gallery cation-montmorillonite electrodes immersed in solns. of)

RN 10294-54-9 HCAPLUS
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

CC 72-2 (Electrochemistry)
Section cross-reference(s): 67
IT Anodes
(**fuel-cell**, montmorillonite-modified graphite with electroactive hexaammineruthenium gallery **cations**)
IT 19052-44-9, Hexaammineruthenium ion(2+)
RL: PRP (Properties)
(redox couple containing, clay-**supported**)
IT 7488-54-2, Dirubidium sulfate 7778-80-5, Dipotassium sulfate, properties **10294-54-9**, Dicesium sulfate 10377-48-7, Dilithium sulfate
RL: PRP (Properties)
(**supporting** electrolyte, depletion of electroactivity for hexaammineruthenium gallery cation-montmorillonite electrodes immersed in solns. of)
IT 7757-82-6, Disodium sulfate, uses
RL: USES (Uses)
(**supporting** electrolyte, in modifying graphite electrodes with clays and electroactive gallery cations)
IT 127-09-3, Sodium acetate
RL: PRP (Properties)
(**supporting** electrolyte, in modifying graphite electrodes with clays and electroactive gallery cations)

L379 ANSWER 103 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:87676 Document No. 116:87676 Gas-diffusion electrode assembly for use in electrochemical cells. Allen, Robert J. (Metallgesellschaft A.-G., Germany). U.S. US 5047133 A 19910910, 7 pp. Cont. of U.S. Ser. No. 315,936, abandoned. (English). CODEN: USXXAM. APPLICATION: US 1990-545761 19900628. PRIORITY: US 1989-315936 19890227.
AB The plenum-free gas-diffusion electrode assembly comprises a catalyzed C cloth or paper **sheet** contacting a solid **metal-supported** current collector **sheet** on 1 **side** (e.g., using a conductive adhesive) and an **electrolyte**-permeable aqueous polymeric hydrogel **coating** on the other **side**, with the current collector **sheet** provided with gas inlet openings (e.g., for H, O, or air) occupying a minor portion of the **surface** of the current collector **sheet**. The **metal support** (especially Pb or Pb **alloy**) comprises a flat **surface** containing a rectilinear narrow gas supply groove extending along 1 edge and opening at the **surface**, a supply passage opening through another edge into 1 end of the supply groove, a rectilinear narrow discharge groove extending along an opposite edge of the **support** and opening at the **surface**, and an outlet opening through an edge of the **support** into the end of the discharge groove. The openings occupy a minor portion of the **surface**. The electrode is used in aqueous solns. for **metals** recovery, **fuel cells**, batteries, chlorine/alkali cells, and other electrochem. cells.
IT **7440-22-4**, **Silver**, uses
RL: USES (Uses)

(conductive particles, adhesives containing, for gas-diffusion electrodes)
RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT **7440-50-8P**, **Copper**, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C25B011-02
ICS C25C007-00
INCL 204258000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 54, 72
IT **Metals**, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
IT Lead **alloy**, base
RL: DEV (Device component use); USES (Uses)
(**support**, in gas-diffusion electrodes)
IT **7440-22-4**, **Silver**, uses 7782-42-5, Graphite, uses
RL: USES (Uses)
(conductive particles, adhesives containing, for gas-diffusion electrodes)
IT 1333-74-0, Hydrogen, uses
RL: USES (Uses)
(electrodes, in recovery of **metals** by electrowinning)
IT 7439-96-5P, Manganese, preparation 7440-43-9P, Cadmium, preparation **7440-50-8P**, **Copper**, preparation
7440-66-6P, Zinc, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
IT 7439-92-1, Lead, uses
RL: USES (Uses)
(**support**, in gas-diffusion electrodes)
IT 138985-98-5
RL: DEV (Device component use); USES (Uses)
(**support**, in gas-diffusion electrodes)

L379 ANSWER 104 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:44143 Document No. 116:44143 Unit cells for solid-**electrolyte fuel cells.** Fushimi, Kazuo; Kitakizaki, Kaoru; Kawakami, Kazuhiko (Neidensha Corp., Japan). Jpn. Kokai Tokkyo Koho JP 03176966 A2 19910731 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-315990 19891205.
AB The cells have successive **layers** of a perovskite-type O cathode, a 10-20 **.mu.m La** fluoride solid electrolyte, and group VII **metal** H anode deposited on a porous **metal support.** The cells can be operated at 200-500°.
IT **7440-02-0**, **Nickel**, uses
RL: USES (Uses)
(anodes, for solid-**electrolyte fuel cells**)
RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-02
ICS H01M004-86; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
ST solid **electrolyte fuel cell**; **lanthanum** fluoride **electrolyte fuel cell**; perovskite oxygen cathode **fuel cell** ; Group VII hydrogen anode **fuel cell**
IT **Fuel-cell electrolytes**
(**lanthanum** fluoride, for low-**temperature** operation)
IT Cathodes
(**fuel-cell**, cobalt **lanthanum** strontium oxide, for low-**temperature** operation)
IT Anodes
(**fuel-cell**, **nickel**, for low-**temperature** operation)
IT **Fuel cells**
(solid-state, low **temperature** operable)
IT **7440-02-0**, **Nickel**, uses
RL: USES (Uses)
(anodes, for solid-**electrolyte fuel cells**)
IT 110620-52-5, Cobalt **lanthanum** strontium oxide ($CoLa_{0.6}Sr_{0.4}O_3$)
RL: USES (Uses)
(cathode, for solid-**electrolyte fuel cells**)
IT 1314-11-0
RL: USES (Uses)
(cathodes, **fuel-cell**, cobalt **lanthanum** strontium oxide, for low-**temperature** operation)
IT 13709-38-1, **Lanthanum** trifluoride
RL: USES (Uses)
(**electrolyte**, for **fuel cells**)
IT 11134-23-9, SUS316L
RL: USES (Uses)
(**fuel cells** with porous **support** of, solid-**electrolyte**)

L379 ANSWER 105 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1991:535567 Document No. 115:135567 Process for preparation of partial oxidation products of alicyclic compounds in oxygen-hydrogen **fuel cell**-type reactor. Otsuka, Kyoshi; Yamanaka, Ichiro (Mitsui Toatsu Chemicals, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 03123746 A2 19910527 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-261494 19891006.
AB Alicyclic compds., i.e. alicyclic alcs. and ketones, are prepared by contacting one catalytic electrode (cathode) with a H-donor, i.e. H, and the other catalytic electrode (anode) with O and an alicyclic compound in a **fuel cell** system using an **ion conductor** (illustration given). The catalytic electrode preferably comprises ≥1 **metal** component or elec. conducting material selected from Group 1-8A and 1-6B **metals** or **metal** compds., i.e. **metal** halides, nitrates, sulfates, oxides, hydroxides, phosphates, or ammonium **salts.** The process simultaneously can generate elec. power. Thus, 40 mL cyclohexane was placed in the cathode chamber of a **fuel cell**-type reactor having a sheet of an anode which is formed by hot-pressing Pt black powder,

graphite powder, and teflon powder, and a sheet of a cathode
similarly prepared from Pd black, graphite powder, and teflon powder,
while separating the electrodes by a silica wool disk impregnated with
85% aqueous H3PO4 which serves as an **ion conductor.**
The cathode and anode were connected by an conducting wire to form a
closed circuit and to the cathode chamber O at 10 mL/min was
introduced while to the anode chamber H containing 2.67 volume % H2O at 21
mL/min was fed to give, after 20 h at 25°, 5.8 µmol
cyclohexanol and 10.2 µmol cyclohexanone with 4.30 mF elec.
current generated.

IT **7772-99-8**, Tin(II) chloride, uses and miscellaneous
RL: USES (Uses)
(cathode containing graphite and palladium and, for electrochem.
oxidation of cyclohexane in **fuel cell** reactor)
RN 7772-99-8 HCAPLUS
CN Tin chloride (SnCl2) (8CI, 9CI) (CA INDEX NAME)

Cl—Sn—Cl

IT **7440-05-3**, Palladium, uses and miscellaneous
RL: USES (Uses)
(cathode containing graphite and, for electrochem. oxidation of
cyclohexane in **fuel cell** reactor)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C027-12
ICS B01J035-02; C07C029-50; C07C035-08; C07C045-33; C07C049-403;
C25B005-00; H01M004-90; H01M008-22
ICA B01J027-10; B01J027-24; C07B061-00
CC 24-5 (Alicyclic Compounds)
Section cross-reference(s): 72
ST alicyclic compd electrochem oxidn; **fuel cell**
reactor electrochem oxidn; cycloalkane electrochem oxidn;
cyclohexane electrochem oxidn
IT Rare earth chlorides
RL: RCT (Reactant); RACT (Reactant or reagent)
(cathodes containing palladium and graphite and, for electrochem.
oxidation of cyclohexane on **fuel cell** reactor)
IT **Fuel cells**
(electrochem. oxidation by, of alicyclic compds. to alicyclic alcs.
and ketones)
IT Alicyclic compounds
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of, to alicyclic alcs. and ketones, in
fuel cell-type reactor)
IT Oxidation, electrochemical
(of alicyclic compds. to alicyclic alcs. and ketones, in
fuel cell-type reactor)
IT Alcohols, preparation
Ketones, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(alicyclic, preparation of, by electrochem. oxidation of alicyclic
compds. using **fuel cell**-type electrodes)
IT 7440-06-4, Platinum, uses and miscellaneous
RL: USES (Uses)
(anode containing graphite and, for electrochem. oxidation of
cyclohexane in **fuel cell** reactor)
IT 7447-39-4, Copper(II) chloride, uses and miscellaneous 7447-40-7,
Potassium chloride, uses and miscellaneous 7447-41-8, Lithium

chloride, uses and miscellaneous 7646-79-9, Cobalt(II) chloride, uses and miscellaneous 7646-85-7, Zinc(II) chloride, uses and miscellaneous 7647-14-5, Sodium chloride, uses and miscellaneous 7647-17-8, Cesium chloride, uses and miscellaneous 7705-08-0, Iron(III) chloride, uses and miscellaneous 7718-54-9, Nickel chloride, uses and miscellaneous **7772-99-8**, Tin(II) chloride, uses and miscellaneous 7773-01-5, Manganese chloride 7786-30-3, Magnesium chloride, uses and miscellaneous 7790-86-5, Cerium chloride 7791-11-9, Rubidium chloride, uses and miscellaneous 7803-55-6 10024-93-8, Neodymium chloride 10025-74-8, Dysprosium chloride 10025-76-0, Europium chloride 10042-88-3, Terbium chloride 10043-52-4, Calcium chloride, uses and miscellaneous 10049-08-8, Ruthenium(III) chloride 10099-58-8, Lanthanum chloride 10099-66-8, Lutetium chloride 10138-41-7, Erbium chloride 10138-52-0, Gadolinium chloride 10138-62-2, Holmium chloride 10361-37-2, Barium chloride, uses and miscellaneous 10361-79-2, Praseodymium chloride 10361-82-7, Samarium chloride 10361-84-9, Scandium chloride 10361-91-8, Ytterbium chloride 10361-92-9, Yttrium chloride 10476-85-4, Strontium chloride 12027-67-7 13537-18-3, Thulium chloride 16903-35-8
RL: USES (Uses)
(cathode containing graphite and palladium and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)

IT **7440-05-3**, Palladium, uses and miscellaneous
RL: USES (Uses)
(cathode containing graphite and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)

IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with hydrogen and, in **fuel cell**-type reactor)

IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with oxygen and, in **fuel cell** reactor)

IT 110-82-7, Cyclohexane, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of, to cyclohexanol and cyclohexanone, in **fuel cell** reactor)

IT 108-93-0P, Cyclohexanol, preparation 108-94-1P, Cyclohexanone, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of, by electrochem. oxidation of cyclohexane, in **fuel cell**-type reactor)

L379 ANSWER 106 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1989:636622 Document No. 111:236622 **Proton-conductive** solid electrolyte. Makino, Tasuke; Matsuhiro, Yasushi (Nippondenso Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01087510 A2 19890331 Heisei, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-245269 19870929.

AB The title **electrolyte** is a BaO-Ce oxide-based compound oxide containing ≥1 oxide of Y, Sc, Yb, Nd, Mg, Pr, and Zn with part of Ce substituted by an element having a bonding strength to O **ion** weaker than Ce. The element can be Zr, Ti, Hf, Si, Ge, Pb, and/or Sn. Thus, BaCe0.8Zr0.1Nd0.1O3-x was prepared by sintering a mixture of BaCO3, CeO2, ZrO2, and Nd2O3. This **electrolyte** showed high conductivity with low-**temperature** dependence at 670-870°. The **electrolyte** can be used for **fuel cells** and sensors.

IT **123998-55-0D**, Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3), oxygen-deficient
RL: USES (Uses)
(**electrolyte**, **proton-conductive**, for **fuel cells** and sensors)

RN 123998-55-0 HCAPLUS
CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

IC ICM C01B035-00
ICS C01F017-00; H01B001-08
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
ST **proton conductive** solid oxide **electrolyte**; barium cerium oxide solid **electrolyte**; zirconium barium cerium oxide **electrolyte**; neodymium barium cerium oxide **electrolyte**; **fuel cell** solid oxide **electrolyte**; electrochem sensor solid oxide **electrolyte**
IT **Fuel cells**
(solid **electrolytes** for, barium cerium oxide-based **proton-conductive**)
IT **123998-55-0D**, Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3), oxygen-deficient
RL: USES (Uses)
(**electrolyte**, **proton-conductive**, for **fuel cells** and sensors)
IT 1309-48-4, Magnesium oxide (MgO), uses and miscellaneous 1310-53-8, Germanium oxide (GeO2), uses and miscellaneous 1313-97-9, Neodymium oxide (Nd2O3) 1314-13-2, Zinc oxide (ZnO), uses and miscellaneous 1314-23-4, Zirconium oxide (ZrO2), uses and miscellaneous 1314-36-9, Yttrium oxide (Y2O3), uses and miscellaneous 1314-37-0, Ytterbium oxide (Yb2O3) 1332-29-2, Tin oxide 1335-25-7, Lead oxide 7631-86-9, Silica, uses and miscellaneous 12036-32-7, Praseodymium oxide (Pr2O3) 12055-23-1, Hafnium oxide (HfO2) 13463-67-7, Titanium oxide (TiO2), uses and miscellaneous 37200-34-3, Scandium oxide
RL: USES (Uses)
(solid **electrolytes** containing, barium cerium oxide-based **proton-conductive**, for **fuel cells** and sensors)

L379 ANSWER 107 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1989:617218 Document No. 111:217218 Anodes for high-**temperature** fuel cells. Hado, Kazuhito; Niikura, Junji; Taniguchi, Noboru; Gamo, Koji; Moriwaki, Yoshio; Iwaki, Tsutomu (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01167957 A2 19890703 Heisei, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-328545 19871224.
AB H-absorbing alloy or **metal hydrides** containing Zr are used as the anodes. The anodes may contain **Ni**, or ≥1 of **Ti**, **V**, **Cr**, Mn, **Fe**, Co, **Cu**, Nb, Mo, W, Al, Mg, Ca and Sr. The anodes may be **coated** with **Ni**, **Cu**, Al, **Cr**, Co, **Pd**, and/or Pt, or with ceramics. High performance of **fuel cells** is obtained. Thus, Zr-**Cu** alloy was pulverized, **coated** with **Ni**, mixed with **Ni** carbonyl, pressed and heated to working **temperature** A **fuel cell** using this anode, Li-doped **Ni** oxide as cathode, and 62:38 (mol ratio) Li2CO3-K2CO3 mixture as **electrolyte** was operated at 650° and showed excellent performance.

IT **7439-89-6, Iron,** uses and miscellaneous
7440-02-0, Nickel, uses and miscellaneous
7440-32-6, Titanium, uses and miscellaneous
7440-47-3, Chromium, uses and miscellaneous
7440-50-8, Copper, uses and miscellaneous
7440-62-2, Vanadium, uses and miscellaneous
RL: DEV (Device component use); USES (Uses)
(anodes containing, for high-**temperature** hydrogen fuel cells)
RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IT **7440-05-3, Palladium,** uses and miscellaneous
RL: USES (Uses)
(**coatings,** on anodes for high-**temperature** hydrogen fuel cells)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-86
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST hydrogen fuel cell high **temp**; zirconium alloy fuel cell anode
IT Ceramic materials and wares

(**coatings**, on anodes for high-**temperature** hydrogen
fuel cells)
IT Anodes
(fuel-cell, zirconium alloys and **metal hydrides**
, for high-**temperature** hydrogen fuel cells)
IT 7429-90-5, Aluminum, uses and miscellaneous **7439-89-6**,
Iron, uses and miscellaneous 7439-95-4, Magnesium, uses
and miscellaneous 7439-96-5, Manganese, uses and miscellaneous
7439-98-7, Molybdenum, uses and miscellaneous **7440-02-0**,
Nickel, uses and miscellaneous 7440-03-1, Niobium, uses
and miscellaneous 7440-24-6, Strontium, uses and miscellaneous
7440-32-6, **Titanium**, uses and miscellaneous
7440-33-7, Tungsten, uses and miscellaneous **7440-47-3**,
Chromium, uses and miscellaneous 7440-48-4, Cobalt, uses
and miscellaneous **7440-50-8**, **Copper**, uses and
miscellaneous **7440-62-2**, **Vanadium**, uses and
miscellaneous 7440-70-2, Calcium, uses and miscellaneous
11101-28-3
RL: DEV (Device component use); USES (Uses)
(anodes containing, for high-**temperature** hydrogen fuel cells)
IT 11134-36-4
RL: USES (Uses)
(anodes, hydrogen-absorbing, **nickel** in, for high-
temperature hydrogen fuel cells)
IT 123697-77-8
RL: USES (Uses)
(anodes, hydrogen-absorbing, **nickel-copper**
alloys in, for high-**temperature** hydrogen fuel cells)
IT **7440-05-3**, **Palladium**, uses and miscellaneous
7440-06-4, Platinum, uses and miscellaneous
RL: USES (Uses)
(**coatings**, on anodes for high-**temperature** hydrogen
fuel cells)

L379 ANSWER 108 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1981:211497 Document No. 94:211497 **Metal hydride**
fuel cells: a feasibility study and perspectives for vehicular
applications. Folonari, C.; Iemmi, G.; Manfredi, F.; Rolle, A.
(FIAT Res. Cent., Turin, Italy). Journal of the Less-Common Metals,
74(2), 371-8 (English) 1980. CODEN: JCOMAH. ISSN: 0022-5088.
AB Several alloys of the **LaNi5** **[12196-72-4]** family
were tested to evaluate their thermochem. and electrochem.
properties using repeated H absorption-desorption cycling. The
alloys show good electrochem. properties, fast discharging and
recharging kinetics, and high H absorption. On the basis of exptl.
results and theor. evaluations, the realization of new types of
fuel cells characterized by **hydride**
electrodes and a solid **electrolyte** is tech. feasible. In
addition to the advantages of conventional **fuel cells**
, a compact simple structure with a high energy d. can be obtained;
the application of this structure to the propulsion of elec.
vehicles could product significant improvements in reliability and
performance compared with conventional and advanced secondary
batteries.
IT **12196-72-4**
RL: DEV (Device component use); USES (Uses)
(for anodes, fuel-cell, properties of)
RN 12196-72-4 HCAPLUS
CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 56
ST **metal hydride** fuel cell; **lanthanum nickel hydride** fuel cell
IT Fuel cells
(**metal hydride**)
IT **12196-72-4** 12213-73-9 62699-62-1
RL: DEV (Device component use); USES (Uses)
(for anodes, fuel-cell, properties of)

L379 ANSWER 109 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1971:9070 Document No. 74:9070 Manufacture of Raney catalyst-containing electrodes. Doetzer, Richard; Kohlmueller, Hans (Siemens A.-G.). Ger. Offen. DE 1909031 19700910, 14 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1969-1909031 19690222.
AB The invention describes the manufacture of high activity Raney catalyst containing electrodes for electrochem. **cells**, especially **fuel cells** having reactants dissolved in the **electrolyte.** Al is electrodeposited on a **metallic support** using an **electrolyte** of the general formula MX.2AlR3, where M is a Na, K, or onium **ion**, X is a halogen or cyanide, and R is an alkyl residue containing 1-12 C atoms; the **temperature** is pref. 80-120°, the c.d. 1-20 mA/cm2, and the voltage 1.5-12 **V.** After deposition, a Raney **alloy** is produced by diffusion at 350-650°. The diffused Al is removed by an aqueous solution of either an alkali **metal** hydroxide or an alkyl halide. The **metallic support** material can be in **sheet** form, porous or nonporous foil, porous sintered solids, or a mesh. Suitable **metals** are: **Ni**, Co, W, **Ag** or their **alloys.**
IT **7440-02-0**, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, **fuel-cell**, Raney type)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 77 (Electrochemistry)
ST Raney catalysts electrodes **fuel cells**; catalysts Raney electrodes **fuel cells**; electrodes Raney catalysts **fuel cells**; **fuel cells** Raney catalysts electrodes
IT **Fuel cells**
(electrodes, Raney catalyst for)
IT Electrodes
(**fuel-cell**, Raney catalyst for)
IT **7440-02-0**, uses and miscellaneous 7440-48-4, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, **fuel-cell**, Raney type)

L379 ANSWER 110 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1969:497758 Document No. 71:97758 **Fuel-cell** electrodes. Vanleugenhaghe, Claude (Societe d'Etudes, de Recherches et d'Applications pour l'Industries S.E.R.A.I.). Ger. Offen. DE 1904768 19690904, 15 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1969-1904768 19690131.
AB A method is given for improving the capacity of **fuel-cell** electrodes consisting of a mixture of C, catalyst, and polymeric fluorohydrocarbon binder on **metallic support.** The electrode is treated with alkali

metals dissolved in liquid NH3, methylamine, or naphthalene plus tetrahydrofuran. Only the **side** exposed to the **electrolyte** may be treated with alkali **metal hydrides** or borohydrides followed by heating at <350°. The electrode can also be treated with alkali **metal** vapors or melts. Thus, an electrode consisting of 200-μ **film** of 5.25% poly(tetrafluorethylene) and 94.75% mixture of 8 parts active C, 10 parts Pt, and 10 parts **Pd** on a **Ni support** is immersed for 75 sec. in a solution of 400-mg. Na in 300-ml. liquid NH3 and dried in air. An H2-O2 cell with 5N KOH **electrolyte** and the prepared electrode has a voltage of 1000-854 mv. at a c.d. 0-300 ma./cm.2 at 70° as compared to 1100-826 mv. for a cell with 50% KOH **electrolyte** and Halderman electrode containing 40 mg. Pt/cm.2 and operating at 100°.

IC H01M
CC 77 (Electrochemistry)
ST **fuel cell** electrodes; electrodes **fuel cell**
IT **Fuel cells**
(electrodes, Teflon-bonded, impregnated with alkali **metals** and calcium)
IT Electrodes
(**fuel-cell**, Teflon-bonded, impregnated with alkali **metals** and calcium)
IT Alkali **metals**, uses and miscellaneous
RL: USES (Uses)
(impregnation with, of teflon bonded **fuel-cell** electrode)
IT 7439-93-2, uses and miscellaneous 7440-23-5, uses and miscellaneous 7440-70-2, uses and miscellaneous
RL: USES (Uses)
(impregnation with, of teflon bonded **fuel-cell** electrode)

L379 ANSWER 111 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1969:487163 Correction of: 1969:435501 Document No. 71:87163
Correction of: 71:35501 Electrodes for electrochemical **fuel cells.** (Leesona Corp.). Brit. GB 1151787 19690514, 3 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19650930.

AB An O electrode for **fuel cells** was fabricated by **coating** a porous **metal support** (0.5-1 mm. thick, mesh size 50-150) of **Ni**, **Cu**, **Fe**, Ta, Zr, Au, **Ag**, or their **alloys** with a dispersion of 55-90% Co and (or) **Ni** or Co-activated **Ni** and 10-45% hydrophobic polymer [such as poly(tetrafluoroethylene), polyethylene, or polystyrene], drying in air at 50-95° under slight pressure, and sintering for 5-35 min. at 220-300°. Thus, a 100-mesh **Ni** screen was sprayed with a dispersion of 15% poly(tetrafluoroethylene) and 85% 1:1 Co-**Ni**, dried for 10 min. at 85°, and after rolling, sintered at 250° for 6 min. When used as a cathode in a half-cell with 65% KOH **electrolyte** and with air as fuel at 150°, the electrode voltage was 0.91-0.98 **v**. and c.d. 100-300 ma./cm.2

IC H01M
CC 77 (Electrochemistry)
ST electrodes **fuel cells; fuel cells** electrodes; **cells fuel** electrodes; oxygen electrode **fuel cells**
IT **Fuel cells**
(electrodes, cobalt-**nickel** in teflon dispersion on **nickel** screen)
IT Electrodes
(**fuel-cell**, oxygen, cobalt-**nickel** in teflon dispersion on **nickel** screen)

IT 7440-48-4, uses and miscellaneous
RL: USES (Uses)
(electrodes with **nickel**, **fuel-cell**)
IT 7782-44-7, uses and miscellaneous
RL: USES (Uses)
(electrodes, **fuel-cell**)
IT 9002-84-0, uses and miscellaneous
RL: USES (Uses)
(in **fuel-cell** electrodes, with cobalt-
nickel mixture)

L379 ANSWER 112 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1969:466734 Document No. 71:66734 Nonstoichiometric boron carbide as a catalyst **support** for fuel-cell electrodes. (General Electric Co.). Brit. GB 1157124 19690702, 12 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19651001.

AB C (e.g. graphite) containing dissolved B is a suitable **support** material for **fuel-cell** electrodes (especially anodes), fulfilling the requirements of being electronically conducting and of having a high resistance to electrochem. oxidation and to attack by strong acids and alkalis, and also enhancing the catalytic activity, yielding a more effective electrode than conventional **support** materials (e.g. C, Ta). The maximum solubilities of B in graphite at **temps.** .apprx.2200° are known (.apprx.2 weight % B) (R. V. Sara, et al., CA 60: 8967g); further added B combines chemical There is a greater increase in performance in material comprising B dissolved in C plus B carbide as a 2nd phase. When stoichiometric B carbide (I) (80 atomic % B) alone is used, the performance is poor. I is believed to have a unit cell of B12C3 with the B atoms at the vertices of a regular icosahedron with the C atoms as linear units of 3 atoms each. High purity I has a relatively high powder resistivity (.apprx.8000 **ohm-cm.**) but this decreases as the amount of C is increased, especially at and above 30 atomic % C. The superior performance of the nonstoichiometric boron carbide (II) is due to the relation between the B carbide crystals and the excess C in the form of graphite crystals containing B. One com. preparation of I and II has been described by Ridgway (CA 28: 71676). The **metal** catalyst (preferably of noble **metals** of Groups VIII and IB) is prepared by thermally decomposing a halogen-free **salt** (e.g. Pt(NH3)2(NO2)2 or AgOAc) on the **support**, to produce **metal surfaces** of area at least 20 m.2/g. A suitable **fuel cell** construction is described in Brit. 1,043,127. The electrode may be prepared by spreading a paste of catalyst-bearing II (particle size <400 mesh, i.e. able to pass through a mesh of 400 holes/lineal inch) and poly-(tetrafluoroethylene) (PTFE) powder suspended in water on a current collector mesh screen, consolidating under light pressure, and heating to 350-400°, to allow the PTFE binder to fuse the mixture into a coherent porous mass. The binder should be 10-30 weight % of the total mixture; the catalyst concentration should be 0.1-50 weight % of the **support** material. For example, 0.500 g. of 800 mesh (8-12 μ) II containing 4.8 weight % Pt was mixed with 0.96 ml. of a suspension containing 0.8 ml. of water and 0.16 ml. of a 60% solids PTFE suspension. The resulting paste was spread directly on a 17/8-in. diameter Pt screen (45 + 45 mesh, 0.0078 in. wire diameter) so that the paste extended through the screen mesh. After smoothing, the structure was fused at 350° for 2 min. A hydrophobic **film** was applied on one **side** by spraying a water-diluted PTFE suspension to form a **film** of 6 mg./cm.2 and then heating at 350° for 2 min. The performances of **fuel cells** with anodes prepared as described and with standard Pt cathodes, were tested for different **support** materials and shown to be best with II containing 60%B.

IT **7440-05-3**, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)

(catalysts, fuel-cell, in nonstoichiometric boron carbide
support)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC H01M
CC 77 (Electrochemistry)
IT Fuel cells
(electrodes, catalytic, with nonstoichiometric boron carbide
support)
IT Electrodes
(fuel-cell, catalytic, with nonstoichiometric boron carbide
support)
IT Boron carbide
RL: PRP (Properties)
(fuel-cell catalyst **support** from nonstoichiometric)
IT 7440-02-0, uses and miscellaneous **7440-05-3**, uses and
miscellaneous 7440-06-4, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, fuel-cell, in nonstoichiometric boron carbide
support)

L379 ANSWER 113 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1969:435501 Document No. 71:35501 Electrodes for electrochemical
fuel cells. (Leesona Corp.). Brit. GB 1151787
19690514, 3 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19650930.
AB An O electrode for **fuel cells** was fabricated by
coating a porous **metal support** (0.5-1
mm. thick, mesh size 50-150) of **Ni**, **Cu**,
Fe, Ta, Zr, Au, **Ag**, or their **alloys** with
a dispersion of 55-90% Co and (or) **Ni** or Co-activated
Ni and 10-45% hydrophobic polymer (such as
polytetrafluoroethylene, polyethylene, or polystyrene), drying in
air at 50-95° under slight pressure, and sintering for 5-35
min. at 220-300°. Thus, a 100-mesh **Ni** screen was
sprayed with a dispersion of 15% polytetrafluoroethyl-ene and 85%
Co-**Ni** (1:1), dried for 10 min. at 85°, and after
rolling, sintered at 250° for 6 min. When used as a cathode
in a half-cell with 65% KOH **electrolyte** and with air as
fuel at 150°, the electrode voltage was 0.91-0.98 **v**
. and c.d. 100-300 ma./cm.2
IC H01M
CC 77 (Electrochemistry)
ST **fuel cells** electrodes; electrodes **fuel
cells**; **nickel fuel cells**
electrodes
IT **Fuel cells**
(cathodes, cobalt-**nickel**, in tetrafluoroethylene
polymer matrix)
IT Cathodes
(**fuel-cell**, cobalt-**nickel**, in
tetrafluoroethylene polymer matrix)
IT 9002-84-0, uses and miscellaneous
RL: USES (Uses)
(**fuel-cell** cathodes from cobalt-
nickel and)
IT 7440-48-4, uses and miscellaneous
RL: USES (Uses)
(**fuel-cell** cathodes from **nickel**
and, in tetrafluoroethylene polymer matrix)

L379 ANSWER 114 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1968:432509 Document No. 69:32509 Hydrogenation catalyst. Jung, Margarete; Kroeger, Hanns H. (Varta A.-G.). U.S. US 3382106 19680507, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1965-485573 19650907.

AB Catalysts useful for **H transfer** reactions, especially those occurring in **fuel cells**, are prepared by saturating with H an alkali-resistant, crystalline **metal** from Group IVB, VB, VIB, VIII, or Pt. The **metal** is impregnated with a 10-3 weight % aqueous alkaline solution of a strong reducing agent such as a complex **metal hydride**, hydrazine and its **salts**, or hydroxylamine and its **salts**, at 10-60°. The process is terminated when gaseous H is evolved. The process may also be used for reactivating spent catalyst. For example, 1 g. **Ni** powder (6-8 μ particle size) obtained by decomposing **Ni** carbonyl was immersed at room **temp** . in 0.5 ml. of a 5% solution of $NaBH_4$ in 4N KOH solution The **Ni** darkened and increased in volume by 290%. After 22 min., gaseous H started to escape from the solution The activated powder was placed between 2 fine sieves and inserted in a **fuel cell** as the neg. electrode. The cell was operated with MeOH dissolved in 6N KOH as fuel and took a load of 10 ma./sq. cm. at room **temperature** while a sample of unactivated powder similarly tested broke down at a load of 0.08 ma./sq. cm.

IT **7439-89-6**, uses and miscellaneous **7440-02-0**, uses and miscellaneous **7440-05-3**, uses and miscellaneous **7440-22-4**, uses and miscellaneous **7440-32-6**, uses and miscellaneous **7440-47-3**, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, fuel-cell and hydrogenation)

RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

INCL 136120000
CC 77 (Electrochemistry)
ST fuel cells **H transfer**; **nickel** catalyst
H transfer; hydrogenation catalyst;
hydrogen transfer catalyst
IT Hydrogenation catalysts
(**metals** as, activated by hydrazine anhydride and
hydroxylamine)
IT **Silver** alloys, containing
(**palladium**-, catalysts, fuel-cell and hydrogenation)
IT **Palladium** alloys, base
(**silver**-, catalysts, fuel-cell and hydrogenation)
IT **7439-89-6**, uses and miscellaneous **7440-02-0**, uses
and miscellaneous **7440-05-3**, uses and miscellaneous
7440-22-4, uses and miscellaneous **7440-32-6**, uses
and miscellaneous **7440-47-3**, uses and miscellaneous
7440-48-4, uses and miscellaneous 7440-67-7, uses and
miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, fuel-cell and hydrogenation)

L379 ANSWER 115 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1968:3603 Document No. 68:3603 **Coating** permeable membranes
with electrically conducting **metallic films**,
especially the inside of hollow fiber membranes. Levine, Charles
Arthur; Prevost, Alfred L. (Dow Chemical Co.). U.S. US 3351487
19671107, 10 pp. (English). CODEN: USXXAM. APPLICATION: US
19631106.
AB Permeable membranes are plated with an elec.-conducting
metallic film by contact of 1 **side** of
the membrane with a **metal-ion** solution and the
other **side** with a reducing agent. With **cationic**
membranes, the **metal ions** permeate the membrane
and are uniformly deposited on the **surface** in contact with
the reducing agent. With **anionic** membranes, the reducing
agent permeates to cause **metal** deposition. The membranes,
which are **films** or hollow fibers, are uniformly plated
with reduced waste and are useful in **fuel cells.**
Thus, polyethylene hollow fibers (120 μ inside diameter) were
chlorosulfonated with 10% ClSO2OH, hydrolyzed, and washed to give an
ion-exchange capacity of 1.5 meq./g. The ends of a treated
fiber bundle were potted in epoxy resin and the cast resin was
machined to expose the open fibers. The encapsulated fiber ends
were mounted in an apparatus that pumped a reducing solution through the
side of the fibers, while their exteriors were immersed in a
plating solution containing 3.5 parts AgNO3, 3 parts H2O, and sufficient
NH4OH to dissolve initial precipitate The reducing solution contained PhNHNH
1, EtOH 11, and H2O 10 parts. After 1.5 hrs., the fiber interiors
were plated with an adherent Ag **film** that did not clog the
membrane pores and had a resistance of 15 **ohms./cm**
. The exterior **surface** resistance was 5000 **ohms**
/cm. Similar conducting membranes were prepared by plating
Ni, Cu, Pt, Pd, and Au on **film** or fiber membranes of
Nalfilm I and II, sulfonated nylon (Accropore 5A 6404 Resin), and
3:7 polyethylene-zeolite mixts. Rochelle **salt**, a
NaOH-HaSH.2H2O-NaH2PO2.H2O mixture, Na2S2O4, a KOH-N2H4.H2SO4-N2H4.H2O
mixture, and N2H4.H2O were used as reducing agents.
IT **7440-05-3**, uses and miscellaneous
RL: USES (Uses)
(**coatings** and linings of, on membranes and hollow
fibers, for fuel cells)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

INCL 117227000
CC 37 (Plastics Fabrication and Uses)
ST COPPER LINING PLASTIC FIBERS; GOLD LINING PLASTIC FIBERS; FUEL CELL FIBER MEMBRANES; NICKEL LINING PLASTIC FIBERS; SILVER LINING POLYETHYLENE FIBERS; **METAL COATING** PERMEABLE FIBERS; FIBERS PERMEABLE **METAL COATING**; PLATINUM LINING PLASTIC FIBERS; PERMEABLE FIBERS **METAL COATING**; PALLADIUM LINING PLASTIC FIBERS; POLYETHYLENE FIBERS **METAL** LINING
IT Membranes
(fuel-cell, from hollow fibers lined with electrically conducting **films**)
IT Fiber, synthetic
RL: USES (Uses)
(hollow, lined with electrically conducting **metallic films**, for membranes for fuel cells)
IT Fuel cells
(membrane for, with hollow fibers, lined with electrically conducting **films**)
IT **Anion** exchangers, uses and miscellaneous
(membranes, and hollow fibers therefrom, **coated** with electrically conducting **metallic films**, for **fuel cells**)
IT Lining process
(of hollow fibers with electrically conducting **metallic films**)
IT **Cation** exchangers, uses and miscellaneous
(sulfonated, membranes from hollow fibers of, lined with electrically conducting **films**, for **fuel cells**)
IT Nylon, uses and miscellaneous
RL: USES (Uses)
(sulfonated, permeable membranes from, **coated** with electrically conducting **metallic films**, for fuel cells)
IT 7440-02-0, uses and miscellaneous **7440-05-3**, uses and miscellaneous 7440-06-4, uses and miscellaneous 7440-22-4, uses and miscellaneous 7440-50-8, uses and miscellaneous 7440-57-5, uses and miscellaneous
RL: USES (Uses)
(**coatings** and linings of, on membranes and hollow fibers, for fuel cells)
IT 9002-88-4, uses and miscellaneous
RL: USES (Uses)
(sulfonated, membranes from hollow fibers of, lined with electrically conducting **films**, for fuel cells)

L379 ANSWER 116 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1967:100942 Document No. 66:100942 Inorganic **ion**-exchange membranes **fuel cell.** Berger, Carl; Strier, Murray P. (Douglas Aircraft Co., Inc., Santa Monica, CA, USA). NASA (Nat. Aeronaut. Space Admin.) Access., NASA-CR-54784, 177 pp. Avail. CFSTI, $3 hc From: Sci. Tech. Aerospace Rept. 1966, 4(6), N66-15227 (English) 1965. CODEN: NAACAF.
AB cf. CA 65, 8326c. The most significant achievement of this program was the development of a Zr phosphate membrane impregnated with catalyst which can perform in a fuel cell at 0.77-0.78 v. at 30 ma./cm.2 This type of fuel cell can operate continuously for at least 1200 hrs. and has a capability of operating at a **temp**

. as high as 151°. Extrapolations of enhanced electrocatalytic activity (i.e., higher catalyst loading in the membrane) and lower membrane resistivity down to the 1 **ohm** **-cm.** level indicate that a fuel cell performance of 0.840-0.850 v. at 30 ma./cm.2 and 0.820 volts at 50 ma./cm.2 should be possible for the inorg. membrane fuel cell. What is most unusual about the membrane is its high strength and favorable conductivity and stability. The incorporation of the zeolite component is conducive particularly to the latter.

CC 77 (Electrochemistry)
IT Electrodes
(**fuel-cell**, **zirconium** **phosphate** **ion**-exchanging membranes impregnated with catalyst)
IT Membranes
(**ion**-exchanging, **zirconium** **phosphate**, for **fuel** **cells**)
IT **Ion** exchangers, uses and miscellaneous
(membranes, from **zirconium** **phosphate** for **fuel** **cells**)
IT **Fuel** **cells**
(with **zirconium** **phosphate** **ion**-exchanging membranes, impregnating with catalyst)
IT 13765-95-2
RL: PRP (Properties)
(**ion**-exchange membranes from, for **fuel** **cells**)

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